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THE CONTRIBUTION OF THE PHYSICAL SCIENCES TO PSYCHOLOGICAL MEDICINE

THE PRESIDENTIAL ADDRESS DELIVERED AT THE ONE HUNDRED AND FOURTEENTH ANNUAL MEETING HELD AT DUBLIN, 13 JULY, 1955

By

JOHN DUNNE, M.D., D.M.D., D.P.H.

Hon. Medical Superintendent, Grangegorman Mental Hospital
Professor of Psychiatry, University College, Dublin

THE honour which the R.M.P.A. has bestowed on me fills me with a mixture of pride and apprehension; pride that I occupy the Chair where have sat so many distinguished psychiatrists and apprehension lest I might be unequal to the task of upholding the noble traditions of my predecessors. In offering you my thanks and appreciation I wish to express my most devout hope that I will prove worthy of the mantle you have placed on my shoulders and pass it on to my successors untarnished. It is pleasant to think that the Irish Division of the R.M.P.A. has held such a long and happy relationship with its Royal parent and that in the field of psychological medicine there has been no cleavage between the Sassenach and the Gael. I am proud to be the figurehead which expresses that unity today.

My first very pleasant task is to wish all of you who have come from overseas "*cead mile failte*". The Irish Division has been looking forward with eager pleasure to entertaining you and we hope that your stay with us will be full of enjoyment and that when you have to leave us you will carry away happy recollections of your visit.

It is fitting that I should refer to the Irishmen who previously filled this Chair, as a mark of respect to their memory. The first Irish President was Dr. Lawlor, who was the Medical Superintendent of this Hospital, in 1861. He was an outstanding figure in the psychiatric world at that time. Under the direction of Dr. Lawlor, the Richmond Lunatic Asylum, as this hospital was then known, had achieved a very high reputation for the manner in which the mentally ill were treated. Dr. Lawlor was in fact renowned for having initiated and developed a system of education of the patients as a front line of treatment in this Hospital. The following few lines from the Commissioners' Report for that year are sufficient indication of the advanced position to which Dr. Lawlor had brought his institution at that time:

"The most thoroughly organized school that we have anywhere seen was in the Richmond Asylum at Dublin. The system has been completely established

and the organization as perfect as any schools in the country . . . demonstrating not only the possibility of promoting good order and discipline by means of schools, but also of increasing the knowledge and improving the morals of persons while in a state of insanity."

Drs. J. E. Duncan, Conolly Norman, of this Hospital, W. R. Dawson, M. J. Nolan, of Downpatrick, and Richard Leeper were subsequently chosen as Presidents in the years 1875, 1894, 1911, 1924 and 1931, respectively. I would like to refer particularly to the great Irishman who was the last to occupy this Chair and of whom I had the great honour to be a colleague.

Richard Leeper, or as he was affectionately known by his friends, Dick Leeper, was probably one of the most outstanding figures in medicine of his day. When he took up the specialty of mental illness he brought with him rare and unusual qualities. His gifts as a raconteur, his delightful sense of humour, his great compassion, his insatiable pursuit of new scientific methods of treatment and his deep concern for improving the humanities which the chronically insane require, were the combined characteristics of a personality which created an indelible impression on all who had the pleasure of knowing him. Those who knew him will appreciate this tribute and those who did not know him will forgive me for taking time to salute the memory of a very great man. *Ar dheis lambh De, go raibh a anam.*

I would like to pay tribute also to the out-going President, Dr. Noel Harris. I had the great pleasure of being present at his induction in London last July and have also had the privilege of being in attendance at Meetings over which he presided during his year of office. I was deeply impressed with the dignity of his bearing, his great capacity for making every one feel at home, and the obvious sincerity and earnestness which he brought to bear on his task as President. The excellent and tactful way in which he presided at meetings were proof of his gift of leadership. His valuable contributions to the literature of psychiatry and his eminence in the world of medicine need no bouquets from me. I am very happy to be his immediate successor and hope to pattern my conduct of the proceedings of the R.M.P.A. for the coming year on his good example.

It is now incumbent on me to turn to more serious topics. It is a tradition of the Association that the newly-installed President begins his term of office by delivering a Presidential Address on some topic of his own choice. Like the newly born infant, whose first cry is hailed with delight by the mother, the new President must give tongue so that his subjects may have audible proof of his vigour. I found great difficulty in selecting a theme for my Address. Many headings occurred to me, such as "The Scottish Influence on Psychological Medicine in England", or "Eccentricities and Idiosyncrasies of Psychiatrists". My muse, however, rejected these titles and decided that I should attempt to present my impressions of the effect of modern scientific advances on psychological concepts. I realize that to cover such a wide field is very ambitious, and I would ask you to bear with me for the many defects which are bound to appear in my summary. I have chosen, then, as a topic "The Contribution of the Physical Sciences to Psychological Medicine".

Medicine today has progressed far beyond its conception as an art and has become a vast field of scientific knowledge which derives from a combination of research in practically all the other branches of science. The isolation of pathogenic organisms, the discovery of antibiotics, sulphonamides and other bactericidal substances, the advances in anaesthesia and surgical technique, are only some of the bewildering series of successes which have yielded to research in recent times. It must be admitted, however, that progress in

psychological medicine has not kept pace with that of somatic medicine. Scientific explanation of the aetiology of mental illness still remains obscure, and treatment is largely based on empiricism. The discovery of the technique of psycho-analysis did, however, mark a very forward step in the study of mental mechanisms and opened up new pathways of research. Today, there is a vast army of research workers throughout the world whose researches in the experimental and clinical fields have made considerable advances towards the unravelling of the mysteries of the human mind. I propose to make a survey of some of the achievements in the various related fields of science and to evaluate their contributions to psychological medicine as a whole.

It is axiomatic that the most complex structures are based on simple principles and components, which can only be discovered by dissection and analysis and that all advanced study must be based on a knowledge of fundamental anatomy. The engineer must begin by studying first simple materials and mechanical principles. The surgeon must acquire a detailed knowledge of anatomy. The sciences of psychology, pathology, chemistry, and others depend on the elucidation of basic principles by dissection and analysis.

While this axiom resulted in the extraordinary progress of mathematical, physiological and other sciences, as exemplified by the amazing discoveries in chemistry, physics and biology, its application to nervous and mental activity is comparatively recent. The first analytical approach was made by Freud. This approach, however, was based on subjective analysis and, therefore, was open to the suggestion that it was lacking in the exactness on which true science is based.

Three hundred years ago, Descartes first propounded that nervous and mental activity depended on mechanisms which had an anatomy and physiology; that nervous and mental activity was a response to external or internal stimuli; that the responses to stimuli were automatic, whether as a result of inherent or acquired influence. Thus the concept of the reflex was born. But its application to higher forms of mental activity did not receive scientific consideration until the advent of Thorndike, who in 1898 published the result of experimental research into the behaviour of animals under special circumstances. Experimentation on similar lines was carried out at the same time by Pavlov, whose publications have revolutionized the concept of the mechanism of mental and nervous activity. By these experiments, obscure and complicated psychological processes were analysed and placed on a comprehensible, scientific foundation. While criticizing the approach of the psychologist as not being sufficiently objective to be included amongst the sciences, Pavlov acknowledges the work of an American group of psychologists who had begun experimenting on similar lines to his own.

Pavlov, in attempting to divorce his studies and conclusions from all suggestion of subjectivity emphasized that the reflex was the basic principle of all nervous activity. On this account he even objected to the use of the term "instinct", holding that instincts are reflex responses to internal stimuli. His experiments with animals have successfully shown that reflexes may be conditioned and altered by the effects of environmental influence. He succeeded in transforming the unconditioned stimuli for a reflex into the conditioned stimuli for another. He showed that reflexes are the means on which behaviour depends. He showed that the organism was capable of acquiring reflex properties which served for protection, and that internal equilibrium, or homeostasis, depends on this principle of the conditioning of reflexes to environmental and internal stimuli. The discovery of the manner in which reflexes can be con-

ditioned opened a new path towards the understanding of psychological processes.

Today, conditioning of reflexes forms one of the most important tenets in theoretical and practical psychology and is recognized to be an essential feature in the development of personality. To quote Gardiner Murphy, "Since each individual encounters different patterns of stimulation and acquires different conditioned responses, personality may be conceived to consist in the conditioning which distinguishes one man from another". The modern psychoanalytical and therapeutic approach to mental abnormality, whether of the major or minor variety, is largely based on the principle of conditioning, even though such may not be admitted by psychological purists. Conditioning is an essential feature in education and training, for example, the special training of soldiers for warfare is a conditioning process in which the conative reactions to emotions are altered.

The principle underlying the conditioning of reflexes would seem to be the underlying basis of well-known aetiological concepts, including those of Hans Selye, whose contributions to the science of medicine are held in such high esteem today. His concepts of the unity of the organisms have not deterred him from seeking an explanation of the causation of mental and bodily disease on physiological, mechanistic lines. His researches have thrown considerable light on the relationship between mind and body, and the manner in which the psyche and soma react on one another to form a unified mechanism. His exposition of the General Adaptation Syndrome (specific and non-specific) and diseases of adaptation marks a highlight in medical science. His concepts of stress as a disease-producing agent and of the manner in which it produces disease, is an example of the application of careful study of mechanism as an essential part of the holistic approach.

In his most recent epigrammatic communication "the General Adaptation Syndrome and its Relationship to Mental Health", he recognizes the important part which conditioning plays in psychological and psychiatric problems and relates the phenomenon to physiological mechanisms. He emphasizes particularly the influence of steroid hormones which are released by stress, and refers to the manner in which the action of these hormones can be inhibited or accentuated by metabolic processes. The conclusion to be drawn from the result of these different scientific approaches is that all biological functioning, physiological or psychological, includes as a basic principle the simple mechanism of reflex action, and that while all stimuli must have a response, that response is subject to variation on account of previous conditioning at the psychological or physiological level.

While the principle and anatomy of the reflex, with its connections and associations within the brain itself and to and from the various organs of the body had been outlined, the energizing basis of the structure remained obscure and knowledge of the source of energy on which cerebral activity was based was very vague. The discovery by Hans Berger in 1929, later substantiated by Adrian, that the brain was the seat of electrical activity marked a phenomenal step forward towards the knowledge of brain physiology.

Following research by other distinguished workers such as Gibbs, Grey Walter, *et al.*, it has been established that oscillatory waves of a constant rhythm are discharged by the brain and that the frequency and amplitude of these vary under certain conditions such as rest and activity, disease, metabolic or toxic disturbances. This study, electroencephalography, has made great strides in the short time that has elapsed since Berger's first observation. It

has become one of the most valuable aids in the diagnosis of brain disturbance such as epilepsy, brain tumour and brain damage. From observation of the use of the electroencephalograph in our own hospital, we have found that the electrical discharges are profoundly affected in cases undergoing insulin treatment and in a number of cases that had cortisone treatment and who developed psychiatric symptoms. It was also observed that a considerable number of cases with recently acquired psychiatric symptoms, of a schizophrenic pattern, displayed electroencephalographic abnormalities. While the electroencephalographic expert was unable to ascribe any typicality to these abnormalities, and even regarded them as somewhat equivocal, there would appear to be a definite association between these departures from normal EEG and certain types of acutely developing mental illness. If the progress made in recent years is any criterion, the co-relation between these electroencephalographic findings and acutely developing mental illness offers a field for fruitful research. Our own studies of the recent concept of traumatic sub-dural effusion, which are the subject of a paper at this Meeting, are sufficient evidence of the importance that must be attached to even equivocal electroencephalographic findings, when associated with clinical symptoms.

It may be now assumed that one of the requisites to healthy cerebral function is the preservation of the electrical equilibrium of the brain and, therefore, it is of the utmost importance to establish the source of electrical activity. Obviously, its generation depends on the activity of chemical and biochemical ingredients in the cellular tissue. The most important of these ingredients appears to be the potassium ion concentration which appears to be influenced by the hormones, particularly adreno-cortical hormones. Other influences which are known to affect the electrical activity of the brain are avitaminosis, toxic substances, such as alcohol, direct or indirect injury, cerebral contusion, etc. It would seem reasonable to assume that many, if not all, functional disturbances of the brain, such as encephalopathies, psychotic depression, types of schizophrenia, are associated with a breakdown or disturbance of the electrical mechanism. An electrical breakdown can be due to faults in generation, in storage or in transmission and, in the case of the brain, may be caused by reduction in the generating substances, e.g. potassium; by the introduction of disruptive substances; by deterioration of the insulating qualities of the cell membrane or nerve fibre; or by actual rupture of the lines of communication, e.g. the association fibres.

In this connection it is interesting or pertinent to refer to a theoretical aspect of the therapeutic effects of E.C.T. The fact that improvement by E.C.T. in depressed cases only persists for a short time and that in some cases the level of improvement can be maintained by repeating an E.C.T. application at long intervals, would seem to point to the conclusion that the passing of an electrical current in some way restores the equilibrium of the electrical activity. While such observations must, indeed, be regarded as purely theoretical considerations, the charging and discharging of electricity in the brain appears to play a vital part in the functioning of the brain. With the further development of electroencephalography in its application to mental disease and in relation to the bio-chemical activity of the brain, new light should be thrown on causation and on therapy.

For the purposes of this paper reference may again be made at this stage to the researches of Hans Selye. Selye has shown that mental stress is responsible for the production of psychic or psycho-somatic symptoms and that stress is always associated with the production of A.C.T.H. and adreno-corticoids. He

has pointed out that corticoids influence the metabolism of salt and water and, indeed, one of the most important considerations in the administration of cortisone is potassium concentration. The tie-up between stress, emotional or otherwise, the increased production of adreno-corticoids, with its consequent disturbance of potassium metabolism, and the disturbance in the electrical activity of the brain, would seem to be an important chain of events in the production of symptoms.

The foregoing considerations of physiological discoveries in the structure and method of functioning of the brain have encouraged further profitable studies of the mechanism of the nervous system. The amazing developments in the sciences of physics, chemistry, electronics and mathematics has resulted in the construction of complex machines which can perform functions that hitherto seemed to be the monopoly of the human brain. Electronic computing machines now exist which can carry out the most complicated mathematical problems, problems in which the qualities of discrimination and judgment are exercised by the machine. Automatic pilots, automatic computing gun sights, automatic radar control instruments, searchlights, etc., possess qualities of adaptiveness, predictiveness and purposiveness as essential parts of their function. Grey Walter's Conditioned Reflex Analogue and the Electronic Delayed Storage Automatic Computer of Cambridge, are instruments in which reflex responses can be conditioned to substituted stimuli similar to the conditioned reflexes of Pavlov. These achievements of science have led to a comparison between the mechanisms of these man-made machines and the mechanism of the brain.

The analogy has stimulated the application of a new method of study to the mechanism of the brain, the science of Cybernetics. Cybernetics has been defined by Ashby as "that branch of science which studies in complex mechanisms the lines of communication which may be established between part and part; the information which may be transmitted along them; the control which each part thereby establishes over the other; and co-ordination which is thereby achieved". The works of Wiener, Ashby, Grey Walter, McCulloch, and others, are convincing masterpieces of logical, mathematical, scientific deduction. There can be no doubt of the soundness of their demonstration of similarities in the mechanism of the nervous system and man-made machines and that the principles underlying one can apply to the other. They have shown that there is a basic principle, the feed-back, which is common to all mechanisms no matter how complex.

A feed-back may be defined as the return to the central, controlling source of activities, by various channels, of information from all the other parts of the mechanism. It depends on channels through which this information may travel from one part to another and, therefore, on the integrity of these channels. Anything which affects the integrity of these channels of information disturbs the co-ordination of functioning and results in defective functioning of the mechanism. "The inco-ordination of Tabes Dorsalis is a simple example of the loss of this information. The ataxia may be correctly ascribed to the loss of feed-back, for, as is well-known, if the lost kinaesthetic feed-back is replaced by visual information, the ataxia is markedly reduced" to quote Ashby. More complicated instances are the different types of aphasia, apraxia and agnosia, in which there is an obvious disturbance in the communications between associated areas of the brain, resulting in loss of feed-back.

"The law of reciprocity of connexions" a physiological axiom enunciated by Lorente de No, as the result of his physiological and histological researches, embodies the principles of feed-back in the functioning of the brain. It would

seem a reasonable conclusion that the principle of the feed-back of the cyberneticist and the reflex of the physiologist are one and the same. The simplest reflex arc is at the physiological level in which there is a receptor, an afferent line of communication to a cell, a line of communication associating with another cell, an efferent line of communication to an effector organ. The response is immediate and automatic.

On the higher scale of thought, the same principle exists, but the communication between cells is very much more complex, depending not only on associated nerve pathways, but also on direct influences from cell to cell by means of chemical and electrical interchanges, and on the influences of distant metabolic and glandular products, the result of nervous activity. The final response to stimuli then on the higher plane, may be regarded as the end solution of a problem presented by the stimulus.

Huxley and Wells have summarized this concept in the following words—"So we begin to realize that the conditioned reflex is the unit of which our higher mental activities are built up . . . in this sense our thinking is a symphony of elaborately associated conditioned reflexes . . . It is because one reflex can inhibit and temporarily suspend another that our organized automatic activity is possible."

Following up the concept that stimuli in the higher plane create a problem which has to be solved, the main problem of existence is adaptation to the environment and to changes in the environment. Every new situation may be regarded as being a problem for a solution of which conduct and behaviour is the final explanation. The application of the cybernetic approach to the mechanism of cerebral functioning, including psychological processes, suggests the presence of compartments or areas in which stimuli are subjected to various processes before the nature of the response is decided. Such compartments or areas are not meant to signify separate anatomical areas, such as Broca's area, but a separate mechanism which may be all contained in one cell. The recent work of Cameron shows the extraordinary complexity and diverse activities of a single cell. These compartments may be approximately represented in the following rough schema:

(1) Impressions are first received.

(2) Selected, namely priority of attention is given to selected stimuli such as visual over olfactory stimuli.

(3) Analysed, namely important data are distinguished from less important data.

(4) Synthesized, namely different important data are related to one another.

(5) Computed, for example, the speed of an oncoming car, the speed of a person crossing, and of distance, are computed so that an appropriate decision may be made.

(6) Referred to problem-solving area of selected, analysed and computed data where

(*a*) The problem is solved.

(*b*) The incomplete solution is stored for future reference, for example, learning by mistakes.

(*c*) The solutions of solved problems are stored, which represents having learned to do something.

(*d*) Data without any problems are stored, for example, learning a poem.

In addition to the foregoing, high speed arcs must be presumed to exist between all areas in order to by-pass any involved process and an area called an

Automat, which releases automatic information stored in the storage area, such as the automatic production of the words of a song.

While this diagrammatic representation is purely hypothetical it complies with the logic of cybernetics and may be applied as a reasonable explanation of mental phenomena on the basis of our physiological knowledge. In sleep, for instance, all data-receiving areas close down except the vegetative ones, e.g. the digestive processes, and centres of urgency, e.g. the capacity of a mother to wake at the cry of her child. In sleep, the brain may be said to be open for urgent business only. Sleep may be further regarded in this way as the shutting down of the data-receiving area on account of data overloading. It is very probable that the solution of new problems only takes place during sleep when data receiving has been shut down. The problem-solving that occurs during wakefulness means only the integration of problems already partially solved or the calling into consciousness of answers to problems already solved and stored for ready reference.

On this basis abnormalities of mental functioning may be explained on the basis of disturbance in the arcs of association between the various areas. In Obsessional Neuroses, for instance, there is a vicious circle of thought which may be explained on the basis that data do not reach the problem solving area but are continuously fed back. The indecision of Anxiety Neuroses may be explained on the basis that the selector is defective and unable to provide a solution to a problem or problems. In effect, it is suggested that mental dysfunction can be logically explained by applying the principles of cybernetics.

To summarize briefly, it is suggested that the successful functioning of mind depends on the integrity of the following mechanisms:

(1) A complex combination of reflex arcs, consisting of nerve cells and fibres, intimately associated with and, depending upon one another.
(2) A system of production of various substances which affect the integrity of this nervous mechanism, namely, A.C.T.H., Corticoids, Minerals, etc.
(3) The generation of electrical potential.
(4) A complicated electrical mechanism which is essential to preserve the communications between the various areas through which the products stimuli must pass before a problem is solved and effect given to the solution.
(5) The existence of special compartments within this mechanism for reception of data, selection, analysis, synthesis, computing and solving of data; of storage areas for unsolved and solved problems; for automats, which are the compartments which govern ordinary behaviour.

In making an analogy of the complicated mechanisms of modern, scientific achievements, with the mechanism of the mind, it is important to bear in mind that the functioning of all the man-made mechanisms depends upon a pre-setting and that without this pre-setting successful functioning would not result. It is clear that in any concept of mental functioning on a mechanistic basis that pre-setting is an essential postulate. The mechanistic concept does not, therefore, in any way come into conflict with the spiritual concept, which must be regarded as the pre-setting of all mental functioning. Indeed, the greater the knowledge, the greater must be our realization that behind it all must be an invisible Power without which this mechanism could not work, and that creation by man of complex machines is only a very small example of the creation of man himself by a Creator infinitely greater than, and far beyond the realization of the human mind.

The various scientific approaches to the explanation of mental functioning

by physiologists, neurologists, bio-chemists, electrologists, cyberneticists, not only appear to harmonize, even synchronize, in the elucidation of mental mechanistics, but also appear to harmonize very closely with the concepts of the psychological purist. As all the physical sciences have made their advances in the past few hundred years, the great Philosophers of antiquity and the Middle Ages depended on the state of knowledge of their time, and philosophy was entirely based on religious concepts. Descartes, who may be rightly called the father of modern philosophy, was the first to separate philosophy from theology. To Freud, however, goes the credit of producing an anatomy of the mind by devising the system of psycho-analysis.

The fact that different schools of psycho-analysts and psycho-therapists disagree with Freudian analysis because of his emphasis on the dominance of the sexual instinct in the shaping of the personality should not blind us to the wonderful advances in knowledge of the mind which were the result of the researches of Freud, his contemporaries, Adler and Jung, and of his numerous successors in the field. Although his concepts were originally based on empiricism and were mainly subjective, it cannot be denied that in his analytical methods he succeeded in bringing objectivity to the study of the psyche, and raised psychology to the level of a science. The importance which is attached to psychology today in all forms of disease, individual, collective, social, industrial and international mal-adjustments, owes its position to psycho-analytical research. As Galdstone pointed out in a concise but comprehensive digest, the psycho-analysts were the first to expound the theory of psycho-somatic medicine as it is understood today. To Freud goes the credit of pointing out that "emotional tension discharged, in ways that upset normal physiological equilibrium, and initiated somatic changes that produce disease". It is interesting to compare this concept with that of the modern Selye.

The latter's concept, based on objective physiological experimentation, while outlining the effects of stress in the production of A.C.T.H., and other hormones, postulates that nervous and emotional stimuli represent the major sources of stress. The urgent pleas by Galdstone, Henderson *et al.*, for a holistic approach to sickness can only be effected by a realization of the inseparability of psychological concepts and mechanistic concepts. The barriers between the two concepts are only figments which do not exist in reality. Each is essential to the other. I am reminded of an attractive simile which was used at a discussion by a speaker at the last quarterly meeting of the Association, when it was suggested that a dichotomy existed between the psycho-analysts and the psycho-therapists and even between different psycho-analytical schools. He compared the efforts of the various different schools of thought to the pioneers who set out to conquer Everest. Different approaches were explored by different groups each profiting by the experience of the others until finally the summit was reached.

The place that Freud occupies in relation to modern psychology may be judged by the prominence given to his work in the writings of Joseph Nuttin, Professor of Psychology in the University of Louvain, and a Catholic priest. In his "Psycho-Analysis and Personality", he sums up "the Freudian Philosophy . . . can be looked upon . . . as the exaggeration of a new and fascinating idea. This should not, however, prevent us either from accepting the valuable body of facts which can be extracted from their theoretical background or from going upon this theoretic view of man to a concept embracing the normal human personality in its entirety". Professor Nuttin has himself propounded that human motivation does not depend exclusively on primitive or instinctive drive but on new needs and drives which appear as man matures and which are specifically

distinct from infantile ones. This concept, which is shared by Allport, does not appear to differ fundamentally from, but rather to be a development of, Freud's original postulates and has indeed been arrived at by the use of analytical methods.

In a very concise Digest of Psycho-Analysis for Catholic readers, C. L. C. Byrnes states "The minute and patient exploration by Freud into the animal side of man's nature has been of immense significance for psychology". In this digest Byrnes quotes from Archbishop Downey "There is a natural alliance between the empiricism of the psycho-analysts and the rational psychology or the anthropology if you prefer, of the scholastics".

Freud's greatest achievement, however, was his structural delineation of mental processes. His exposition of the manner in which personality and character are developed and moulded, his demonstration of the effect of environmental influences on the shaping of personality, his schematic representation of mental mechanisms, are concepts which form the basis of all modern psychology. His division of mental functioning into compartments, notably, the Id, the Ego and the Super-Ego, the Conscious, the pre-Conscious and the Sub-Conscious, was the first attempt to produce a language of psychology. It is inherent in all languages that fallacies appear as it becomes more complicated, as in the language of mathematics. Such fallacies become apparent when parts of the language come into conflict with basic philosophical truths. Psycho-analytical language is not, and does not claim to be, immune to this principle.

The difference between the language of the cyberneticist and the psycho-analyst would by comparison seem to be no more than exists between the spoken tongue of two different countries, for example, of France and England. "Maison" and "house", "fils" and "son", are different symbols for expressing the same meaning. It is a source of wonder that the language invented by Freud when the physiology of the brain was practically unknown, should so closely conform to the mechanisms later uncovered by physiological research. The symbols of Id, Ego, Super-Ego, of Conscious, Pre-Conscious and Unconscious, mind, of censor, repression, dissociation, conversion, projection and repression are all definable in terms of the more objective principles of Physiology and Cybernetics. The following few examples give an indication of the unity of meaning between the language of Psychologists and Cyberneticists—censoring, involving repression, appears to be identical with the process of selection and storage of data; reasoning and judgment are identical with computing and problem solving; the unconscious, with the storage of data and solved and unsolved problems.

The Id, being the seat of Instincts, may be regarded as containing pre-setting influences which guide behaviour. While the Instincts are the main pre-setting influences in lower animals, they should only be regarded in man as subordinate to an overall pre-setting direction of what may be termed the spiritual instinct. This spiritual instinct is contained in the religious concept of the desire for good in the human. While an innate, inborn tendency towards good may not be accepted by the behaviourists as a delineable, scientific entity comparable with the other well-defined instincts, such as the sexual instinct, practically all anthropological studies have shown that in the most unenlightened and primitive of human races there exists an individual and collective belief in a higher, invisible being representing the human concept of seeking for all that is good. While the standards of good may vary in different races it cannot be denied that the overall aspirations of the human mind are towards good. This aspiration towards good is represented by the presence from a very early age of

conscience and one of the well-recognized early causations of mental illness is a knowledge or sense of guilt practically from the beginning. Conscience may, therefore, be regarded as an essential part of human mental equipment, embryonic at birth, but later to reach its full development in what Freud called the Super-Ego. McDougall describes it as the "desire to realize an ideal of character and conduct; a desire which itself springs from an instinctive disposition whose impulse is turned to higher uses by the subtle influences of organized system embodying a moral tradition". Nuttin sums up contemporary psychology as "coming close to the concrete reality of psychic life through its deep study of the interpretation of the instinctive and the spiritual in human motivation".

Freud defines the Super-Ego as activities of self-observation, conscience and the holding-up of ideals; the representation of all moral restrictions; the advocate of the impulse towards perfection. These concepts from such varying schools of thought would seem to establish that the most important aspect of mental mechanisms, namely the pre-setting, depends on a spiritual instinct.

In this summary of the various approaches to the scientific explanation of mental functioning it seems apparent that a stage has been reached in which different scientific discoveries form a compatible relationship with one another and conform to the requirements of scientific and spiritual concepts. This summary appears to satisfy and include the various controversial theories of materialism, animism, parallelism, epiphenomenalism, etc. Such summary and comparison does not presume in any way to add anything to philosophical or psychological knowledge but is merely intended as an essential basis in the approach to therapy of mental disease. The proof of the integrity of any scientific research is its integration with other sciences. It would be impossible in an address of this kind to devote sufficient time to therapy. Even a summary of modern therapeutic methods could not be fitted in without unduly wearying my listeners. Indeed, my summary of modern scientific advances has many omissions which might well have been included.

It would seem fitting, however, to make some reference to the most widely practised form of therapy in the world today and indeed the most controversial, namely, psycho-analysis. All clinical psychologists cannot but agree that psycho-analysis forms one of the major methods of treatment for the psycho-neuroses. The fact that the techniques of psycho-analysis vary very widely is not peculiar to psycho-analytical therapy. Differences in technique are common to all therapy. There is one principle, however, which emerges and which must never be lost sight of.

Psycho-analytical therapy which would not have as its first objective the restoration of the higher motivation of the Super-Ego cannot be regarded as complying with the concept of the rational composition of the human mind. The balance or homeostasis of the mind cannot be complete unless and until the pre-setting gear of the super-ego has been restored to harmony with the various other mechanisms. All the various techniques of free association, explanation, abreaction, dream interpretation, suggestion, depending as they do on the special relationship between the patient and the physician must have as their ultimate object the restoration of spiritual re-integration.

While, however, this philosophico-psychological consideration forms an essential part of human psycho-therapy it must be realized that the therapist is not dealing with the soul but with mental mechanisms which have for some reason or other ceased to function properly. Ethico-religious departures may and do occasionally set up conflicts which give rise to anxiety states or other

even graver forms of mental illness and in such cases must form the basis of the therapeutic approach. With such rare exceptions, however, the approach to therapy must be based on the general concept that mental disease is the result of a break-down in some part of the organization of the mechanisms of mind, the most important aspects of which have been referred to briefly in this Address.

I have attempted to make a digest of the scientific aspects of psychological medicine and to compress them into a cohesive whole. I fear that my achievement has fallen far short of what I set out to do. I hope, however, that in bringing the physical sciences and psychological and spiritual concepts into a compressed relationship, my address will help to clarify in a very small way the confusion that so many different approaches might well inspire in the student of Psychiatry. I would also express the hope that the broad perspective I have outlined may perhaps help the pioneers in different schools of thought to realize that in each approach is contained values not always conceded.

Finally, I wish to thank my listeners for so patiently and tolerantly listening to this address.

THE THIRTIETH MAUDSLEY LECTURE: PERCEPTION AND IMPERCEPTION

By

Sir W. RUSSELL BRAIN, Bt., D.M., LL.D., D.C.L., P.R.C.P.

Physician to The London Hospital and to
The Maida Vale Hospital for Nervous Diseases

I VALUE very much the honour of giving the Maudsley Lecture. Henry Maudsley was a pioneer in the study of the physiological basis of mind, and hence of the physiological interpretation of mental disorder. In the preface to his book, *The Physiology of Mind* (Maudsley, 1876), he said with a blend of optimism and modesty: "The current of psychological thought having set so strongly in physiological channels, it is pretty certain that the reflections which one person has had, however original they may seem to him, some other person has had, has now, or will very soon have." But half a century was to pass before physiology and psychiatry began to develop techniques which could illuminate the physiological basis of mind, and even now we are only entering the era which Maudsley would have found the fulfilment of his hopes and anticipations. Though intolerant of the idea that metaphysical speculation about mind could take the place of scientific study, he was nevertheless a philosopher, and my aim in this lecture is to try to use a philosophy of perception to interpret the clinical observations of perceptual disorder.

I have chosen as the subject of my lecture "Perception and Imperception". You will probably think that the meaning of perception is fairly clear, at any rate until psychologists explain what it means. I have taken the term "imperception" from Hughlings Jackson (1932). He first used it for a disability which he described as follows: "The first symptoms were those of what I call imperception. She often did not know objects, persons and places. To the statement that there was only 'confusion of mind', I do not object, for I should say that her mental confusion showed itself in inability to recognize objects, persons and places. Nor do I object to its being called 'only loss or defect of memory'; it was a loss or defect of memory for persons, objects and places. Nor do I mind it being said that there was 'only imbecility'; imbecility, like confusion of thought and defect of memory, is nearly always a matter of defect in perceiving things (persons, objects and places)." I shall use the term "imperception" in the most comprehensive Jacksonian sense, to refer to a "defect in perceiving things (persons, objects and places)".

Disturbances of perception play so large a part in the work of the neurologist and the psychiatrist, that a full description of them would occupy a lecture in itself. The main categories are:

1. Imperception of objects by different sensory channels—the agnosias.
2. The wide range of disturbances of awareness of the body itself, from the phantom limb, through imperception of one half of the body, to unawareness of disease, reduplication of parts of the body, and reduplication of the body itself in autoscopy. There are also the peculiar sensations which many patients describe in some part of the body, most frequently the head, or characterizing

the whole body, and the whole puzzling category of pain which seems to have no organic basis.

3. Awareness of space outside the body may be disordered.

4. The vast and varied range of hallucinatory states must be considered.

5. There is the experience common to a number of different types of mental disorder, in which an object, otherwise normally perceived, seems to the percipient to be endowed with some unusual emotional power, attractive, sinister, or terrifying. In this field no sharp borderline can be drawn between the pathological and the normal, since social and cultural factors may endow certain objects with these characteristics for normal people.

Psychiatry and the Philosophy of Perception

What light does the philosophy of perception throw upon these conditions? The average man, if he ever considered the matter at all, would no doubt express the view of a naive realist on perception. The sensory qualities of an object, such as the colour of the table, he would say, are parts of the physical object, and seeing and touching are the modes, amongst others, by which we become aware of the characteristics residing in objects. Many considerations combine to make this view untenable (Broad, 1927; Brain, 1951). Briefly, these are (1) that nerve-impulses are unlike the physical stimuli which evoke them, (2) that it is necessary only that stimulations of the appropriate cortical areas should occur in order that sensations may be experienced, (3) that by the time a nerve-impulse reaches the cortex the physical stimulus which originated it is always past, and in the case of astronomical events often long past. I see a flash, not when the light-waves leave their source, but when the resulting nerve-impulses reach my brain. An event which I witness in my perceptual world is therefore always contemporaneous with the event in my brain which leads me to perceive it. "Hence, when we are aware of an object, the sensations by means of which we perceive it can't be part of a physical object, for their physical basis in the brain is the sole necessary condition of their occurrence, and this is physically unlike, and occurs later in time than, the physical events in the object which make me aware of it" (Brain, 1951).

Thoughtful people, aware of the facts of neurophysiology, soon realized that sensory qualities could not be parts of physical objects, but, if they are in some way generated by the brain of the person who experiences them, this gives rise to the question how they appear to be located in objects outside his body. This led to the idea of the "projection" of sensory qualities from the brain on to the external world.

This view is much nearer the truth than naïve realism, but it is unsatisfactory, because "projection" is an imaginary process which has no counterpart in either physiology or psychology. It arises from a confusion between perceptual and physical space, a point which has been stressed during recent years independently by a number of writers (Köhler, 1938; Russell, 1948; Hutton, 1950; Brain, 1951; and Smythies, 1954). Let me quote Russell's (1948) summary of the true position. "When I say that something is 'outside' me, there are two different things that I may mean. I may mean that I have a percept which is outside the percept of my body in perceptual space, or I may mean that there is a physical object which is outside my body as a physical object in the space of physics . . . One of the difficulties which have led to confusion was failure to distinguish between perceptual and physical space. Perceptual space consists of perceptible relations between parts of percepts, whereas physical space

consists of inferred relations between inferred physical things. What I see may be outside my percept of my body, but not outside my body as a physical thing." I have not time today to do more than draw attention to the semantic aspect of this question which has recently been discussed by Woodger (1952).

What happens, then, in perception? Each of us possesses a physical body existing in physical space. Various kinds of physical impulses reach its sense-organs from without, or originate within the body itself. Their arrival at the sensory areas of the brain leads to the creation by each individual of his own perceptual world, including his perceptual body, and extending outwards from it; and presenting all the sensory characteristics and spatial organization with which we are familiar. This world is private to each of us, but since each of our private perceptual worlds *represents* the same common physical world, and since all our brains are organized on fundamentally the same pattern, our private perceptual worlds resemble each other closely. Since moreover we have means of communicating with each other and sharing experiences, we habitually speak of them as though they were identical with the common physical world which they represent.

I am not now concerned with the philosophical or semantic puzzles created by the idea of a perceptual and a physical space, but merely to see what follows from the fact that the perceptual space of each of us is a private construct. The main distinction in the perceptual space of each person is that between his body and everything outside it. I am identified with my body in a way in which I am not identified with the table, for example, yet the perceptual features of both are the products of the activity of my physical brain, and in that sense both are subjective.

It might be thought that from the causal point of view there is a clear distinction between the objective and the subjective parts of the perceptual world, namely, that what I call the objective part is all the product of stimuli coming from the physical world outside my physical body and evoking responses from what Sherrington calls the "exteroceptors", while what is subjective is derived from stimuli originating within my physical body. But this is not so. The stone in my hand feels cold, but the coldness *of the stone* is identical with a fall of temperature in the skin of my fingers. Similarly the perceptual quality of solidity *in the stone* is the product of nervous impulses from the skin, joints and tendons of the hand, which are felt, not as such, but as characteristics of the stone. In the same way impulses from the proprioceptors of the eye-muscles contribute to our ideas of visual distance. We call them "unconscious" afferents, which means that we do not recognize them as giving information about the eye-muscles: they are, however, ingredients in the *gestalt* comprised in a visual perception. Labyrinthine impulses are an even more obvious example. We do not recognize them as contributing to our visual space until they become disturbed. Vertigo results, and "the room goes round". The following principles emerge from this survey of normal perception.

1. The perceptual world is not identical with the physical world, but is a representation of it.

2. The perceptual world is a construction of the brain of each individual and is private to him.

3. Within the perceptual world there is a distinction between the body and percepts outside the body, but this does not correspond to the distinction between the physical body and events outside it in physical space, for bodily sense-data contribute to the sensory characteristics of the external world of perception.

4. The external world of perception is thus doubly subjective. (*i*) It is a construct of the subject's brain and (*ii*) it incorporates sensory experience derived from the subject's body.

Perception and Hallucination

These ideas illuminate both what may be called the perceptual status of hallucinations, and their spatial characteristics. The term hallucination, of course, covers a wide range of phenomena, associated with various states of consciousness. The perceptual status of hallucinations is illustrated most clearly by those which occur without clouding of consciousness in psychotic states or after the ingestion of hallucinogenic drugs. In the broadest sense, the mode of production of hallucinations is clear. Normally, the sensory experiences which we call perceptions do not occur unless they are initiated by physical stimuli arising outside the body, or, in the case of perception of the body, within the body but outside the brain. Consequently they include nothing but representations of the external world, and representations of, or feelings located in, our bodies. Abnormally, however, the parts of our brain which are concerned with perception may be aroused into action by some stimulus which does not come from the external world, and does not reach them by the passage of normal nerve-impulses from the body. In such cases the part of the brain abnormally stimulated responds either by causing the subject to experience whatever sensations or combination of sensations it is its function in ordinary circumstances to produce, or in a more complicated way by arousing images and memories. And since it is the function of the brain in perception to represent objects in perceptual space, it will tend to do this with these abnormal experiences. The result will be that the subject will perceive in his perceptual space things which, unlike the objects normally there, do not represent objects existing in physical space. If the subject sees a hallucinatory cat on a real table, the perceptual status of the cat is the same as that of the table, and the sense data connected with seeing the cat are as real as the sense-data connected with seeing the table. Moreover, the sense-data connected with seeing the cat are where they appear to be, just as the sense-data connected with seeing the table are where they appear to be, namely, in his private perceptual space. The only difference between the perception of the cat and the perception of the table is that the cat does not represent an object in physical space, whereas the table does. There is thus no justification for the belief that there is something *perceptually* unreal about hallucinations. Wicksteed (1953) expresses this idea very well in the explanation which he gives of Blake's Visions: "In all his latest and greatest works," he says, "it is therefore as necessary to understand the peculiar idea of his Vision as it is to understand that of his Verse. His own peculiar Vision was something that no one else could see, but was flashed as it were upon a screen that *everyone* else could see and of which he too was acutely conscious." Hughlings Jackson (1932) makes a similar point when he describes a patient who was a cabman and who thought that his bed was a cab. The fact that Jackson uses the terminology of projection does not invalidate his main point. He said: "This patient saw a cab, had that image strongly 'projected', his objective state, at a time when I saw a bed, when I had that image strongly 'projected', my objective state. It is of no avail for trustworthy witnesses to assert that the patient '*could not have seen*' a cab, because there is no cab present, and therefore, that the patient 'only fancied', etc. that he saw one. Something, not himself, 'got out of' himself the image cab, 'out of' the

bystander the image bed. It might be said that this doctrine confuses reality and unreality. But what reality and whose reality? The image cab was the patient's reality; the image bed was the healthy bystander's reality."

The occurrence of hallucinations, which blend in this way with the perception of the external world, implies that the hallucinogenesis is superimposed upon an otherwise normal distinction in perception between the subjective and the objective, the hallucination taking its place among the objective elements. But the disorder of function which leads to the hallucination may disturb space-perception in a variety of ways. For example, the perceptual space of a dream differs from that of waking life. The hallucinatory experiences evoked by Penfield (Penfield and Jasper, 1954) by stimulation of the temporal lobe often took place in a space of their own, which co-existed, but was not identical, with the perceptual space of the operating theatre. A patient's consciousness may alternate between a hallucinated space and the space of his normal perception, as occurred in a patient of mine with a right parieto-occipital vascular lesion, who from time to time saw buses coming towards him on the left side, but when he looked towards them they were no longer there. They appeared real while he saw them, but as soon as they vanished he knew they had been unreal. In many cases the normal distinction between subjective and objective disappears, and then the hallucination, which is objective in the sense that it is regarded as emanating from outside the ego, is nevertheless located somehow *within* the subject, inside the head, for example, or has some other subjective signature.

Perception and the Body

When we realize that the normal perception of the body is, like our perception of the external world, a subjective construction of the physical brain, it illuminates a number of bodily symptoms which otherwise seem odd, or even inexplicable. In speaking of hallucinations I have drawn a distinction between the sense-data of normal perception, which are evoked by stimuli reaching the body from the external world, and the alien sense-data causing the hallucinations, which originate within the brain. A somewhat similar distinction exists in the perception of the body itself. The normal awareness of the body is derived from sense-data arising from the skin, the proprioceptors, including the labyrinths, to some extent the viscera, and vision. It is intimately related to awareness of the external world, since it forms a constant background to our actions. Though I have spoken of "awareness" of the body most of this information is at any one time unconscious, only that part to which attention is momentarily directed being conscious knowledge.

It is perhaps even more difficult to realize that our perceptual bodies are not identical with our physical bodies than it is to make this distinction between the external world of perception and the physical world. The phantom limb, however, is an excellent example. The experience of a phantom limb may occur, of course, not only after the amputation of a limb, but also after a lesion which interrupts in the appropriate manner the afferent pathways from the limb to the relevant sensory areas of the brain. The patient feels as though the phantom limb is still in existence after its amputation, or, when the phenomenon is the result of a lesion of the nervous system, he feels as though he has a limb in a different position from that occupied by the actual limb, and this constitutes one form of reduplication of parts of the body. The phantom limb, of course, is present to certain sensory modalities, but not to others: it *feels* as though

it is there and the patient may say that he is able to move it, but he cannot see it, nor can he touch it. Where, then does the phantom limb exist? The answer surely is that it exists in the patient's private perceptual space, and its characteristics throw light upon our awareness of perceptual space, and illustrates the fact that objects in perceptual space are not identical with physical objects. A man can both feel and see his own physical arm, but a phantom arm can have the characteristics of being felt but not seen. Thus, our awareness of objects in perceptual space, even of parts of our body, is the result of a summation of sensations derived from different sensory channels, and if a part of the body is removed, but impulses continue to reach the nervous system through one sensory channel previously excited by it, that part of the body is still experienced in perceptual space, but in an incomplete fashion.

A phantom limb may feel as though it passes through solid objects in the environment. A patient of mine with a severe lesion of the spinal cord felt as though he had two phantom legs which were always experienced as extended in line with the trunk. When he was sat up in bed, although his trunk became flexed on his hips, his phantom legs remained in their extended position and felt, therefore, as though they moved through a right angle through the bed. Thus, the phantom limb, which does not represent a physical limb, does not obey the physical laws to which physical limbs are subject, but it is intermingled in the perceptual world with perceptual objects which do represent physical objects, and which therefore behave in accordance with their laws, with the bizarre result which I have just described.

The converse of the phantom limb is that form of imperception in which the patient ceases to be aware of one half of his body, denies its existence, and if, as commonly happens, it is paralysed, denies the paralysis also. And just as the patient with a phantom limb feels as though his limb were there, although he cannot see it, so, conversely, the patient with autotopagnosia, or anosognosia, denies the existence of his limbs or disowns them although he can still see them. These limbs continue to exist in the physical world, but they have dropped out of the patient's perceptual world. It would seem that impulses derived from the limb itself are prepotent over visual sensations in establishing a perceptual representation of the limb, for they maintain the phantom limb in perceptual space, although vision denies its existence, and vision alone is not sufficient to preserve the patient's awareness of his limb. Such a patient may be said to have visual agnosia for some of his own limbs.

Perhaps one of the most striking features of imperception of one half of the body is that the patient should have lost not merely his awareness of it, but also apparently his memory of it, so that it can drop out of consciousness without leaving a noticeable gap. And yet, perhaps, on reflection it is not so surprising, since the two must be closely related: it is difficult to see how a patient could now be unaware of his arm and leg if he remembered that he had ever been aware of them.

Delusional, or perhaps it would be better to say, hallucinatory reduplication of parts of the body has recently been the subject of a paper by Weinstein and his colleagues (1954). I have already given instances of such reduplication owing to the presence of phantom limbs, one pair of which can be seen and not felt, while the other pair can be felt but not seen. Weinstein and his fellow authors come to the conclusion that it is "difficult to explain the phenomenon as a disturbance of the body-schema in the usual sense of a three-dimensional image of the body", because reduplication occurred not only with parts of the body, but temporally and spatially as well, and they also stress the importance of

psychological motivation. Reduplication in time introduces another dimension into the phenomenon. If a patient were to fail to distinguish his memory of the position of a limb at one time from his actual awareness of it at another, he would inevitably experience a reduplication comparable with the reduplication of space produced in Penfield's patients, which led to their experiencing at the same time a dream-space, or a memory-space, and the space of the actual present in the operating theatre.

Reduplication of the body itself, or autoscopy, is a phenomenon which also occurs in more than one form. Usually the subject sees himself as though he were looking at himself in a mirror, and the image imitates, like a mirror-image, the subject's own movements. Less commonly he feels that he is disembodied and looks from outside upon his own body which seems usually to be unconscious either in sleep, in anaesthesia or in a severe illness. This was described by a patient of mine who suffered from narcolepsy and hypnagogic hallucinations. She would fall asleep in a chair and then seem to be outside her body looking down upon her sleeping form. The condition described by Lhermitte (1951) as negative autoscopy consists of a failure on the part of a subject to recognize his own features when seen in a mirror.

Autoscopy, as Lhermitte points out, can occur under a variety of conditions, in dreams, in epilepsy, in states of delirium, and as the result of organic disease of the brain. A number of writers have described their own experience of it. Closing the eyes, and even loss of vision, does not interfere with it. Lhermitte offers this explanation of it. "If one looks at autoscopy purely from the phenomenological point of view there is no doubt that this strange manifestation of the double is linked with the objectification, the projection outside oneself, of the body image which each of us carries in himself." Lhermitte is here using the language of projection. Translated into the language of the representationalist view of perception, it means that the subject includes in his perceptual construction of the external world a visual representation of himself. The two principal varieties of autoscopy then appear complementary to each other: in the one, the subject identifies itself with his normal perceptual body; the double then has a somewhat phantasmal character. In the other, he identifies himself with the phantom and looks upon his normal body, i.e. its perceptual representation, which, since he is no longer identified with it, is unconscious.

I have chosen to speak first of the more bizarre disturbances of perception of the body in order to make clear the subjective character of all those sensory characteristics which compose our awareness of our bodies. It then becomes much easier to understand the minor disturbances which consist of peculiar sensations experienced in various parts of the body, but for which we are apt to say there is no organic basis, which, of course, cannot mean that such peculiar feelings have no anatomical and physiological basis in the brain: it is merely a kind of shorthand for saying that they differ from the other common type of sensory disturbance which is produced either by abnormal stimuli reaching the sensory nerves as a result of bodily disease, or through the effect of disease upon these pathways themselves. These peculiar sensations are so familiar that I need not try to enumerate them, indeed it would be impossible to do so. They may affect a part of the body, or the parts in relation to one another, or the body as a whole, particularly, perhaps, in its spatial relations to the environment. They may occur either in normal people, while falling asleep or during sleep, or in patients with minor or major mental disorders. Let me quote one typical example described by a patient suffering from an anxiety-state after a minor head-injury.

"My feet feel large and sizzling, like elephant's pads . . . As soon as I settle in bed, my feet would start with pins and needles which would creep over the entire body. Then head would appear to enlarge to immense proportions and body would shrink to nothing. This would then sometimes alternate."

All such symptoms become readily comprehensible if we regard them as the result either of the intrusion into the perceptual body of abnormal feelings which have their origin elsewhere than in the stimuli which normally lead to its construction or of disorders of the integration or presentation to consciousness of the body-image.

Among all such abnormal feelings pain occupies a position of special clinical importance. The term psychogenic pain has been used to differentiate such pain from pain produced by organic disease. In this difficult field we encounter a number of problems. The first is to be sure that no organic cause for the pain exists, and this I find grows more difficult the greater one's experience of these patients. The absence of familiar signs of disorder of the pain pathways does not entirely exclude it, as we see in the case of trigeminal neuralgia. Nevertheless, let us accept as a fact that patients do complain of persistent and distressing pain in the absence of any organic disease. The next problem is to know what the patient means when he says that he has pain. We cannot experience his pain, and whereas we all have experience of the pain produced by organic disease, and therefore know to some extent what it is like when it is described by someone else, we have not had experience of a pain which has no organic basis. We cannot, therefore, know that when a patient speaks of such a pain he means by the word "pain" the same kind of experience which we should be having if we said that we were in pain. And, of course, it has frequently been pointed out that psychogenic pain is often unaccompanied by the physical concomitants of a pain of organic origin. Nevertheless, we must, I think, believe that the perceptual bodies of these patients have been modified by the intrusion of these painful elements, in other words that the unpleasant sensations are real and that they are experienced in that part of the perceptual body in which the patient describes them.

Art as the Representation of Feeling

The theory of perception which I have been discussing throws some light upon the nature of art, which is of value for the interpretation of a much wider sphere of mental life. Susanne Langer (1953) has devoted her recent book *Feeling and Form* to a development of the idea that "art is the creation of forms symbolic of human feeling". The relationship between art and feeling is obvious enough, but the sentence I have quoted gives rise to two questions: Is the relationship one of symbolization, and by what means is it brought about? I suppose that the ordinary explanation of the relationship between art and feeling is a causal one. A work of art is said to cause feelings in the person who contemplates it, and "beauty is in the eye of the beholder". This, however, is again to confuse the physical and the perceptual worlds. Undoubtedly the physical object which constitutes the work of art, operating through its own particular physical medium, so influences the physical brain of the percipient that he experiences the feelings associated with its contemplation. The physical object which is a work of art is one thing and the feelings which it evokes are another. But this is not true of the world of perception, where, as we have seen, a perceptual object is itself subjective. In the perceptual world feelings can be embodied in concrete form, as we have just seen so vividly in the case of the

perceptual body. So the artist, when creating a work of art in his own perceptual world, constructs it of his own *feelings* as well as his own visual, tactile or auditory sense-data. It is therefore a mistake to suppose that the feelings associated with perceiving a work of art are subjective in some way in which the sense-data composing it are not. On this view a work of art is not symbolic of human feelings: it is literally an embodiment of them. A physical object is modified by the artist until it assumes in his perceptual world the form which embodies his feelings, so far as his competence as an artist allows. This physical object is then available to form representations in the perceptual worlds of other observers, where, in so far as their senses are acute and their minds attuned by nature and experience to the mind of the artist, they will find similar feelings of their own embodied. In this way art is the communication of feelings.

Of course the feelings are only one element in the artistic object. In many instances art involves also the communication of ideas; or its communication of feelings may pre-suppose the existence of the appropriate ideas in the percipient. There are many sources for such ideas, including a common social or cultural heritage. Religious art, for example, pre-supposes the whole system of ideas which form the content of the religion. A social or cultural system of beliefs may confer feeling-qualities upon objects or persons independently of their artistic value.

The process of the embodiment of feelings in perceptual objects may, however, be purely an individual one. This is the explanation of the attribution of emotional qualities of various kinds to persons or objects by patients suffering from major or minor mental disorders. Fetishism is an example of this. An object in the perceptual world of the patient acquires abnormal emotional qualities. This neurosis might be described as a private work of art. The emotional quality, however, is conferred upon an existing type of object and not upon one created for the purpose, and therefore it exists only in the subject's perceptual world and is incommunicable. If, however, such a patient has artistic capacity, he may succeed in embodying his feelings in a work of art, and so communicating them to such other people as are predisposed to share them. Conversely, the feelings which a true artist embodies in a work of art may be so private that the work of art remains for others merely a collection of sense-data, and fails to convey any feelings to them. All of us, then, embody our feelings in perceptual objects. The artist does so to communicate his own satisfactions to others; the psychotic patient in the unshared solitude of his private universe.

The Anatomy of Perceptual Disorders

What are the principal anatomical facts concerning the perceptual disorders that we have been considering?

1. Lesions of the upper part of the brain-stem may cause hallucinatory states, Lhermitte's "peduncular hallucinosis".

2. Lesions of the right parieto-occipital region are especially likely to cause states of imperception of the opposite half of the body, autotopagnosia and anosognosia.

3. Disorders of the temporal lobe, especially epileptic attacks originating there, are prone to disturb perceptual awareness both of the external world and of the body, and to cause illusions and hallucinations, as Penfield has shown (Penfield and Jasper, 1954). Temporal lobe lesions tend to disturb awareness of the body as a whole, or of its relation to the environment, but sometimes of only one of its parts.

4. Weinstein and Kahn (1955) in their recent book on *Denial of Illness* state that which cortical area is damaged is unimportant for the production of this symptom, provided that the deeper structures are involved; they have found that it may occur with lesions of the third ventricle, diencephalon and mid-brain. They believe that the body-schema cannot be localized in any part of the brain as an anatomical representation.

5. Similarly, Lhermitte points out that the relationship of hallucinations to a lesion of a particular sensory pathway is often indirect. For example, when a patient with homonymous hemianopia has visual hallucinations, they may be localized in either the blind or the seeing half-fields.

Here we encounter the difficult question of the relations between cerebral structure and function, one aspect of which is the meaning of the term "cerebral representation". Let me take the visual cortex as a simple illustration. If the visual cortex is stimulated electrically, visual sensations are experienced; if it is destroyed, blindness results. At first sight, this might suggest that the visual cortex plays some exclusive part in visual consciousness—that, neurologically, vision, as it were, ends at the visual cortex. But this does not follow and is probably untrue. We know that visual impulses arriving at the visual cortex cause a widespread irradiation of neural impulses through the brain, which can be picked up electroencephalographically. Let us suppose that beyond the visual cortex vision is an electrophysiological pattern to which large areas of the brain, or perhaps the whole brain, resonate. Then the visual cortex would be merely the last point at which the visual functions of the brain are sufficiently concentrated in space and time to be disturbed by the local effects of disease or elicitable by electrical stimulation. Elsewhere vision would be so much a function of the whole brain as to be unaffected by focal lesions. I believe this to be true of perception as a whole. The selective agnosias—visual, auditory, tactile, etc.—raise physiological and psychological problems which are still unsolved, and which I shall not discuss here. In contrast with these are the more general disturbances of consciousness characterized by hallucinations and illusions, and often, though not invariably, by clouding of consciousness, i.e. by some degree of imperception of the environment. It is significant that such disturbances are often associated with lesions of the upper part of the brain-stem, the diencephalon and the anterior part of the temporal lobe, all of which are now believed to be concerned with the regulation of consciousness, a subject which also bristles with unsolved problems.

It is in conformity with the holistic view of nervous activity which I am proposing that a satisfying explanation of hallucinations must take account of many things besides the lesions, in particular the patients' perceptual psychology, emotional background and past experiences. Thus the neurological account requires the psychological for its completion. Disorders of the body-image provide two examples of this. Weinstein and his colleagues (1954) point out that reduplication of parts of the body cannot be explained merely as the result of the cerebral lesion: it reflects the patient's emotional attitude to his illness. And the common neurotic pains, dysaesthesiae, and sensory distortions of the body can be understood only in the light of their psychological interpretation. Here, as so often in psychiatry, we encounter the mind-brain relationship which challenges us in the very title of Maudsley's work *The Physiology of Mind.*

Let me in conclusion spend a few moments in examining his philosophy, as he states it in the first chapter of *The Physiology of Mind.* He begins by pointing out the inadequacy of limiting the study of mind to the study of consciousness,

since the brain has "mental" functions which do not reach consciousness, which is "but an incidental accompaniment of mind". Maudsley was a monist. "Mind, used in the sense of substance or essence, and brain, used in the sense of organ of mental function, are at bottom two names for the same substance . . . He who should insist on keeping these different symbols of the same substance or process punctiliously distinct on every occasion, and should scrupulously shrink from ever translating one into terms of the other, makes an abrupt and arbitrary division in knowledge where there is continuity in nature." This is well-recognized today, and even the greatest devotee of the neurophysiological approach to psychiatry will often admit that speaking to the patient is in some circumstances the best method of treatment. Nor is it in the least unphysiological, for it is merely employing the most delicate method of changing the electrical activity of the cortex. In any case it is most unlikely that psychiatry will ever be able to dispense with either physical or psychological methods. There is, however, a subtle danger in what I believe to be the erroneous idea that the physiological approach to mind is more fundamental than the psychological, that theoretically at least physiology can somehow *explain* mind, because what goes on in the brain is the *cause* of the thoughts, feelings and other phenomena we call mental. I have not time to discuss the difficult question fully now. If we adopt either Maudsley's monistic view or some form of psychophysical parallelism, a brain-state cannot be the cause of its corresponding mind-state; because either they are two aspects of the same thing, or they are simultaneous. But it is widely believed that, on either view, the physical laws, which are held to regulate the nervous system, must apply to the mind. I believe that this is an error in semantics. As Woodger (1952) put it, "causal laws in physics are not between physical objects and sensible objects, but between physical objects only", and Dingle (1952) says: "In any rational argument one must proceed from premises—from evidence—to conclusion, and not from conclusion to premises, and in the practical, commonsense philosophy it is the latter course that is taken. Experience is interpreted as a consequence of the action of the world of material objects on the sensitive body. But what we know immediately is experience; the world of material objects is what we (rightly or wrongly) infer from it, and a scheme which attributes the data to the action of an inference from the data thereby declares itself as essentially irrational. In the same breath we say there must be a world of matter because we have experiences, and we have experiences because there is a world of matter which causes them. On such a basis it is not to be expected that great systems of rational thought will be erected."

The fundamental problem here is the logic of the translation of the language of physiology into that of psychology, and conversely. And we should never forget that mind and brain are both abstractions—abstractions from persons, with whom, we, as doctors, are ultimately concerned.

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"MEMORY FUNCTION" IN PSYCHIATRIC PATIENTS OVER SIXTY, SOME METHODOLOGICAL AND DIAGNOSTIC IMPLICATIONS*

By

M. B. SHAPIRO, M.A., Ph.D.

F. POST, M.B., M.R.C.P., D.P.M.

B. LÖFVING, F.K.(Stockholm)

and

J. INGLIS, M.A., Dip.Psych.

Institute of Psychiatry, Maudsley Hospital, London

THE aim of the research of which this study forms part, is to examine the relationship of certain aspects of mental functioning to the psychiatric illnesses of old age.

One of the apparent deficits of function to which psychiatrists commonly attach importance is "memory impairment". This is considered part of various clinical syndromes, especially of the "organic" disorders of senility. The assessment of memory is, therefore, of considerable practical importance and most psychiatrists working with elderly patients use some kind of "memory tests". Such tests are usually unstandardized and lack objective scoring criteria.

There are, in relation to memory assessment, some points of conflict between clinical usage and the evidence of objective psychological investigations. For example, the existence of a "memory function" which could be considered as relatively independent of general mental functioning or intelligence, has not been well substantiated when some such clinical tests have been put to critical examination. Eysenck and Halstead (2) after a brief review of the literature and an experimental attack on this problem, conclude that ". . . the ability involved in the clinical tests of memory studied in this research was identical with that involved in the intelligence test used, and that, therefore, it was misleading to accept scores on these various tests as estimates of a person's 'memory' ability."

Some doubts have also been expressed about the kind of "memory disorders" which may be observed. The consensus of both lay and psychiatric opinion concerning the disturbances noted in the senile organic disorders, for example, accepts "Ribot's Law of Regression" as applied to memory; that is to say, that memory for recent events is in these patients poorer than memory for events in the remote past. Mayer-Gross, Slater and Roth (8) say, of senile psychosis, that "The onset is gradual, and the disease may seem at first to be an acceleration of the normal processes of ageing. The patient's memory usually becomes affected first; he is unable to retain or recall events, though his *memory* for remote experience seems intact." On the other hand, Jones and Kaplan (7) in their review of some psychological studies which have attempted to examine the adequacy of this "Law", conclude that it oversimplifies the nature of the apparent memory loss in the disorders of old age.

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In addition, little or no attention is paid clinically to the fact that the concept of "memory" may subsume several distinct processes. Hull (6) for example, has noted that ". . . it is at once apparent that under the expression 'poor memory for recent events' . . . are grouped without distinction two things which are psychologically very different and which may quite probably be expected to vary more or less independently of one another. One is the rate of formation of associations, and the other is the degree of retention of these associations, once they are formed."

This paper is concerned with the first stage of the investigation of some of these problems. This stage comprises the examination of the discriminating power of certain objective test results as between "functional", "doubtful" and "organic" groups of patients, these groups being defined respectively as suffering from "Psychiatric illnesses not associated with cerebral pathology", "Illnesses associated with very mild or dubious organic involvement", and "Psychiatric illnesses definitely associated with cerebral pathology". The tests were designed to examine systematically some of the notions commonly held about the nature of mental dysfunctioning in elderly psychiatric patients. Five groups of tests were decided upon and they are briefly described below:

(*a*) Measures which attempt to systematize the formal unstandardized procedures which are part of the psychiatric investigation given routinely to patients in this hospital and also in common use elsewhere: Mayer-Gross, Slater and Roth (8). These measures are together labelled the "Clinical Sensorium Test" and include such tasks as learning and remembering a name and address and reciting the months of the year backwards.

(*b*) Measures which are an objectification of the observations the clinician uses when he makes a judgment of "memory impairment" in a patient. These tests are subsumed under the title "Clinical Questionnaire" and are especially concerned with finding out what differences, if any, there are between memory for recent events and memory for remote events. This questionnaire contains, for example, such items as "Where were you born?", "How far did you go in school?", and, "How did you get here?", "When were you admitted?"

(*c*) Measures which attempt to objectify the kind of symptoms of "memory disorder" which would result in a relative taking the patient to see a doctor. This group of items is called the "Memory Questionnaire" and includes observations as to whether the patient can find his way about the ward, knows where the lavatory is, and the like.

(*d*) The kinds of test a psychologist might use or invent to examine those various aspects of mental function which might be subsumed in the concept of "memory", e.g.:

1. "Memory for first testing session", which consists of simple questions of the form "How many days ago did I see you?"

2. The New Word Learning and Retention Test: Nelson (10) which is concerned with the learning and retention of the definitions of words presented orally.

3. The Bender Gestalt Test: Bender (1), which is a simple test of the ability to perceive visual patterns and reproduce them accurately. This test is included in view of the fact that apparent differences in "memory" may be due to differences at the stage of impression in the learning process. Clinical use of the test has suggested that a tendency to poor recall of the designs may be characteristic of brain damaged patients: Hanvik and Andersen (4), a simple recall version of the test is, therefore, included.

(*e*) A test of general intelligence is included which consists of four subtests of the Wechsler Bellevue Adult Intelligence Scale: Wechsler (13). The purpose of this test is to see whether differences appearing on "memory" items can be accounted for in terms of differences in intelligence.

Method

Subjects

The sample of patients tested numbered 102. These patients were both men and women, who were admitted consecutively to the geriatric unit of the Bethlem Royal Hospital over a period of about one year. Their ages ranged from 60 to 92 years, with a mean age of 68·64.

An attempt was made to examine every patient admitted during the period the investigation was being carried out. Five patients, however, had to be omitted from the investigation because they were too demented or too disturbed or out of contact to respond to any questions. Eight of the 102 patients could not be tested on all items because of defective vision. No patient had been given E.C.T. before testing in the admission period during which the investigation took place.

The procedures used in dividing this sample into various diagnostic groups will be described later.

Tests

A standard method of administration and objective scoring criteria are used for each of the following tests:

Clinical Sensorium Test. This consists of six short subtests as follows:

1. This item comprises seven simple questions concerned with the patient's orientation for time and place: e.g. regarding the day of the week and the location of the hospital.

2. This item is intended to measure immediate and delayed recall of a name and address. The name and address is read aloud by the examiner and repeated until the patient is able to reproduce it correctly. After five minutes the patient's memory for the address is tested.

3. This is a "Logical Memory" test adapted from the "Memory" item of Year X (Form L) of the Terman-Merrill Binet (12). The examiner reads a short paragraph, which gives an account of a city fire, to the patient who then has to repeat as much of this as he can remember.

4. This item is called a "Concentration Test". It consists of two tasks: naming the months of the year backwards and repeating digits forward and backward.

5. This is an "Arithmetic Test" which includes three simple problems and the "Serial Sevens" test in which the subject is required to count backward from 100 by sevens.

6. This item is the so-called "Cowboy Story": Henderson and Gillespie (5). It consists in a short story about a cowboy and his dog, the patient being required to grasp the point of the story when it is read to him.

Clinical Questionnaire. This consists of three main types of question intended to measure the patient's ability to answer questions about his past life and recent personal and general events. It comprises the following:

1. "Memory for remote personal events", which consists of twelve questions concerned with the patient's early life, such as place of birth, name of

school, age at and year of marriage, children, occupational history and the like.

2. "Memory for recent personal events", which consists of ten questions concerned with admission to hospital (time, form of transport, etc.), and immediate memory for time and person (such as last interview with doctor, name of doctor, etc.). This test is given on the 6th–10th day after admission to hospital.

3. "Memory for recent general events", which consists of ten questions concerned with well-known public events, persons and dates. The patient is also asked about some recent event within his own sphere of interest: e.g. sport, films, politics, etc.

Memory Questionnaire. This includes three sets of questions on memory for immediate events or orientation in hospital:

1. "Memory for time and hospital routine", includes questions dealing with ward activities, social activities, visiting days, times of meals, etc.

2. "Memory for people on ward", in this test the patient is asked to tell who is in charge of the ward, who sleeps in the same room, and the like.

3. "Orientation on ward": in this test the patient is shown a plan of the ward and is asked to indicate where various places are situated (lounge, bedroom, dining room, etc.). The original intention had been to ask each patient to draw a plan of the ward but this procedure was discarded, since it was found to be too difficult for most patients. In addition, each patient is tested on the ward, being asked where he sleeps and so on.

Psychological Tests. These are of three main types:

1. "Memory for first testing session." This test is given two days after the administration of the Wechsler and the New Word Learning and Retention tests and consists of six questions, such as: "How many days ago did I see you?" "Where was it?" etc.

2. New Word Learning and Retention Test: This test is intended to assess the patient's ability to learn and his capacity to retain simple word definitions. Its administration in this investigation is slightly modified from the method described by Nelson (10). It consists in getting the patient to learn, by successive auditory presentations, the first five successive words of the Wechsler Vocabulary list which he fails to define correctly; that is to say, the learning test is introduced at the point where the Vocabulary test is discontinued according to Wechsler's criterion.

(*a*) "Learning Measure"—The words are presented and defined orally. After this first presentation the examiner asks for the correct definition of each in turn. If the patient fails to respond correctly the examiner repeats the definition. The examiner changes the wording somewhat (in an unstandardized manner) on each presentation, in order to prevent rote learning of a verbal pattern and to make sure that the patient has grasped the meaning of the word. When all the five words have been correctly defined twice by the patient, this part of the test is stopped. In order to prevent over-learning of the first-learned words, each word correctly recalled on two occasions is dropped from later presentations of the list. If necessary each word is presented ten times. In this way the test is brought within the capabilities of most patients; nevertheless, in this study, some still failed to learn all the words. In that case, if a word is still not learnt after ten presentations it is dropped and counted as a failure.

The learning score is the number of definitions necessary to learn all the words. As some of the patients in this study failed to complete the test, and

additional score of "partial learning" was calculated equal to the number of words which were learnt to the criterion.

(*b*) "Retention Measure"—This consists in a measure of the patient's ability to retain the five words over varying periods of time. The patient is not informed, at any time, that he is going to be asked about the words again. Word retention is tested twice; first, after an interval of 20 to 25 minutes; this period being occupied by the administration of two subtests of the Wechsler intelligence scale. It has frequently been pointed out that one of the most important conditions governing retention is the amount and sort of activity in the intervening time interval between learning and reproduction. The first interval in this version of the test is, therefore, fixed at 25 minutes so as to be under the control of the examiner and contained within one testing session. This enables a measure of retention to be secured which is relatively uninfluenced by uncontrolled extraneous factors. The sum of correctly defined words after this period is the first score of retention. Since, in this study, some patients failed to learn all the words an alternative score of retention was given in which the number of words retained was considered as a proportion of the number of words actually learned. The second test of retention is given two days after learning has taken place. It is administered and scored in the same way as the first test of retention.

3. Bender Gestalt Test: This is a relatively simple test of perceptual function, performance on which also involves reproduction by drawing. The test consists of six designs of the Bender Gestalt somewhat simplified and enlarged in order to enable patients with slightly defective vision to do the test. Each patient is asked to copy all the designs and, after an interval of one minute, to draw them from memory. A quantitative adaptation of Bender's scoring was developed by Miss Löfving.

Intelligence Tests. These comprise four subtests of the Wechsler Adult Intelligence Scale. They are the Vocabulary, Similarities, Block Design and Picture Completion, subtests.* A few minor alterations were made in the administration procedure described by Wechsler. In the first item of the Similarities subtest the patient is prompted not once but twice, if he gives an inferior answer and is told that a likeness is required and, if necessary, the correct answer is also given twice. No time limit is applied in this test or in the Picture Completion test. Apart from these alterations, the material and procedure are exactly the same as Wechsler's. The subtest weighted scores are used in all calculations. No I.Q.'s were computed as no data are available which would permit these to be reliably calculated for this age group.

The patients in the present study were tested by one of the psychologists (Miss Löfving) on most tests; they were administered in three sessions. Each session required from thirty to sixty minutes. The interval between the first and second session was fixed at two to three days. In addition, each patient was tested once by the junior doctor in charge of the case. The doctor administered the clinical tests (i.e. the Clinical Sensorium and the Clinical Questionnaire). This session required from 45 to 60 minutes. Most of the patients were co-operative; occasional irritability and agitation were fairly easily smoothed over. On the whole the patients appreciated the testing as part of the full general

* A product moment r of ·956 has been obtained between a combination of these subtests and the full-scale Wechsler test. For this validation study a sample of 65 patients was drawn from a senile population of the Bethlem Royal Hospital, identical to that of the present experimental population in terms of age, intelligence and clinical diagnosis. A detailed report of this study by Miss Löfving is to appear.

examination to which they were submitted during the early part of their stay in hospital.

RESULTS

The analysis of the results will be presented in two stages; these stages being the outcome of different methods of classifying the patients into the "functional", "doubtful" and "organic" categories.

First Investigation

In planning the study, much consideration was given to the problem of contamination of data. In its "direct" form this contamination consists in the clinician having some knowledge of the psychological test results, and perhaps unwittingly, using such knowledge as part of his criteria for classifying the patients into the various diagnostic groups. When the groups are arranged on this basis and these test results are then further examined, it is of course found that they discriminate very well between groups. The error inherent in such a method is obvious, it lies in the fact that the clinician has pre-judged the validity of the test items whose validity is, in fact, under scrutiny.

Care was taken to avoid this form of contamination in this first investigation. The psychiatrist (Dr. Post) had no knowledge of any of the test results. The first classification was done on the basis of his "global" clinical impression of each patient's illness gained from a study of the history and thorough examination of the patient. The criteria which he used in sorting the patients into groups can be outlined as follows:

Functional. This title was used in the sense in which the term is employed in describing conditions such as obsessional neurosis, manic-depressive psychosis, schizophrenia, etc. In most of the patients the illness was of recent onset and insufficient time had passed to allow all problems of diagnosis to be clarified. It was, however, possible for the psychiatrist to state in a high proportion of cases that there was nothing to suggest the presence of cerebral pathology from the way in which the illness had developed or from the state of the patient as seen during several weeks of observation.

Organic. This label was applied to patients with histories highly suggestive of cerebrovascular incidents or of progressive memory and intellectual impairment; these signs were also evinced on routine clinical examination. Physical examination may, in some cases of this group, also have revealed abnormal neurological signs confirming the suggestions in the history of cerebral pathology.

Doubtful. This term was used to describe cases in which neither the history not the clinical examination allowed the psychiatrist to place the individual as lying clearly in either the functional or in the organic group. The psychiatrist was doubtful whether the illness was purely functional when any of the following features were present; a history suggesting a character change occurring over a number of years (e.g. increasing hypochondriasis, pre-occupation with money, deterioration of personal standards); an account of fainting turns without clear cut loss of consciousness or epileptiform features; very mild difficulties of memory; doubtful impairment of some special function (such as spatial orientation); or dubious neurological findings. In addition, poor organization of delusional pre-occupations or the occurrence of occasional visual hallucinations may have made the diagnosis of a functional condition doubtful.

On this first classification the distribution according to clinical grouping was as follows:

Group	Numbers
Functionals	52
Doubtfuls	24
Organics	26
Total	102

The means and standard deviations of each of these three groups were computed on 29 variables. The significance of the differences of the means of the groups for each variable was estimated by analysis of variance. The results are shown in Table I.

TABLE I

	Functionals		Doubtfuls		Organics			
	M	SD	M	SD	M	SD	F	P
Age	66·35	4·89	69·40	6·10	69·44	7·93	3·00	—
(a) *Clinical Sensorium:*								
Orientation	6·31	1·58	5·75	1·20	4·46	2·30	10·03	XXX
Name and address test	4·75	2·08	4·04	2·42	2·54	2·29	8·65	XXX
Logical Memory	8·00	4·06	6·73	3·70	6·15	4·29	2·05	—
Concentration	12·84	2·99	11·00	2·95	9·65	3·18	10·23	XXX
Arithmetic	3·08	1·39	2·50	1·53	1·88	1·66	5·66	XX
Cowboy Story	3·79	1·93	2·92	2·23	2·69	2·52	2·73	—
Total: Clinical Sensorium	38·77	10·72	32·81	10·45	27·58	13·32	8·74	XXX
(b) *Clinical Questionnaire:*								
Memory for remote personal events	9·62	1·99	8·63	2·46	6·92	2·50	12·50	XXX
Memory for recent personal events	7·60	2·18	7·54	1·99	5·58	2·96	6·96	XX
Memory for recent general events	6·50	1·94	5·00	2·32	3·88	2·99	11·50	XXX
Total: Clinical Questionnaire	23·71	5·08	21·17	5·62	16·42	7·59	13·08	XXX
(c) *Memory Questionnaire:*								
Memory for time and routine	15·42	3·36	14·30	3·04	12·04	4·77	6·78	XX
Memory for people on ward	11·48	6·67	9·41	7·37	6·32	6·56	3·34	X
Orientation on ward	12·68	2·68	11·64	2·90	9·48	3·61	7·92	XXX
Total: Memory Questionnaire	39·58	10·66	35·41	12·27	27·92	13·09	9·05	XXX
(d) *Psychological Tests:*								
Memory for 1st testing session	9·27	2·69	7·70	8·29	6·38	3·09	3·31	X
Learning (NWLRT)	17·80	10·47	23·20	15·18	29·40	15·68	6·38	XX
Retention Ia	8·35	2·02	7·54	2·87	8·62	2·89	1·26	—
Retention Ib	3·87	1·19	3·37	1·50	3·04	1·37	3·60	X
Retention IIa	7·34	4·73	6·89	3·68	5·61	3·58	1·08	—
Retention IIb	3·23	1·38	2·70	1·63	2·61	1·58	4·42	X
Bender Copy	20·28	3·29	18·55	3·64	15·68	3·82	13·95	XXX
Bender Recall	11·12	5·23	9·30	4·83	6·48	4·18	7·46	XX
(e) *Intelligence Tests:*								
Vocabulary	10·87	3·14	9·21	3·18	8·23	3·34	6·12	XX
Similarities	7·54	3·67	6·08	2·84	4·50	3·11	7·26	XX
Picture Completion	8·90	3·62	7·05	3·87	5·27	4·16	7·88	XXX
Block Design	6·06	2·61	4·86	2·32	4·04	2·76	5·61	XX
Total Subtests (Pro-rated)	83·31	28·79	69·25	25·91	55·19	26·92	9·21	XXX

Key—Levels of significance: X = ·05; XX = ·01; XXX = ·001.

As may be seen from Table I, when the groups are thus compared most of the variables are found to discriminate between the group means at high levels of confidence. The only variables which fail to differentiate significantly between the means are two items of the retention test, i.e. of the New Word Learning and Retention Test, and two subtests of the Clinical Sensorium, i.e. The Logical Memory test and the Cowboy Story. The mean ages of the groups are not significantly different.

Despite the care which had been taken to avoid "direct" contamination of the data in this first investigation, a close examination of the results shown in Table I and the method by which they had been derived, suggested that a kind of "indirect" contamination might have seriously affected the findings.

Thus, while the psychiatrist who classified the patients had no knowledge of the actual results of the psychological tests or of the clinical tests administered by the junior doctor, and while he was in any case critical of the validity of the tests in the Clinical Sensorium group, Norris and Post (11), nevertheless, he could not fail to form impressions of general cognitive efficiency and memory functioning from the patient's history and during his clinical examination. These impressions may then have entered into his criteria for sorting the patients into the groups. The purpose of giving the test items, however, was to objectify such impressions so that their actual diagnostic value could be empirically determined. If these impressions formed any part of the criteria for classification then agreement between the psychiatrist's sorting and the test results might only mean that his impressions of cognitive status could be confirmed by objective tests. "Indirect" contamination might, therefore, have taken place, since the aim of the study was to investigate the possible nature of the relation of cognitive and memory function to illness and not merely to measure a relationship already assumed to exist. Two factors mainly might have contributed to this indirect contamination, these being:

1. That the objective measures used in fact gave good estimates of the sort of cognitive and memory functioning that the psychiatrist may have used implicitly in his sorting criteria.

2. The psychiatrist was a good clinical judge of such functions.

These facts taken together might result in significant differences between the group means without the underlying variables having any relation to brain damage.

It was, therefore, necessary, in order to eliminate the possibility of such contamination, for the psychiatrist to re-classify the same patients, again into three categories: "functional", "doubtful" and "organic", *but this time using only the most objective criteria unrelated to cognitive or memory function.*

Second Investigation

In order that the groups might be so reformed, the psychiatrist provided a check list of signs (so far as possible avoiding any related to cognitive function) which he considered would help him to decide whether a patient could be classified as organic or not. He provided eight signs, four from the history and four from the examination of the patient. The relevant information was taken from the case notes by one of the psychologists (Inglis). This was done about one year after the first classification. The signs were:

History. (*a*) Cerebral incidents or attacks, that is to say, a history strongly suggestive of focal cerebral disorder, including fits, transitional paresis and the like. (*b*) Confusional episodes, that is to say, episodes of abnormal behaviour and psychotic experiencing in a setting of disorientation. (*c*) Incontinence, except if occurring only at the height of the illness. (*d*) Character change, such as deterioration of personal habits and/or caricaturing of previous personality traits: e.g. increased pre-occupation with money, health and so on.

Examination. (*a*) Confirmed neurological signs or symptoms, including aphasia. (*b*) Perplexity, that is to say, an impression or complaint of bewilderment or puzzlement. (*c*) Grossly abnormal EEG. (*d*) Presentation of a clinical picture not clearly belonging to one of the recognized "functional" psychiatric syndromes, e.g. depression with schizophrenic symptoms and visual hallucinations.

The only additional information provided to the psychiatrist was the sex

and age of each patient. The pages on which the information was recorded were coded by random numbers so that the physician could not recognize the patients by name. The three groups were then reformed. This regrouping was itself done twice, the second time as a check on the first; they were done as follows:

The psychiatrist read the sheets on which the information was recorded and then formulated a diagnostic impression from the items on the check list. This impression was not derived by giving explicit "weights" to each item recorded but was made in terms of the psychiatrist's clinical judgment of the diagnostic implications of the individual's record as a whole.

A check on the objectivity of the above method was then done to make sure, for example, that the psychiatrist had not merely remembered the patients (and so his previous diagnosis) on the basis of distinctive patterns of symptoms. This check consisted in numerical weights being given to the various signs. The highest weightings were given to what seemed to be the most severe and also the most objectively founded evidence of cerebral pathology. The main recommendation concerning what weight was to be given to each sign was made by Shapiro, who had not seen any of the actual raw data. The patients were again reclassified, this time on the basis of their weighted scores alone, this reclassification was done by another psychologist (Yates) who was not otherwise connected with the research and who had not previously seen any of the data.

The agreement between these two latter methods of reclassification, the psychiatrist's based on a clinical assessment of the signs and the other done by numerical weighting, was almost complete. Of the 67 cases reclassified by the psychiatrist as "functional", 66 were also classified as "functional" by the check method. Of the 18 classified as "organic" on this occasion by the psychiatrist, 15 were also similarly classified by the check method. Because of this good agreement, it could be inferred that previous knowledge had not significantly distorted the physician's judgment in reclassifying the patients and, therefore, his regrouping could confidently be used as a basis for the second investigation.

Three main questions may now be answered through analysis of the results of the second investigation:

1. It can be shown whether there is any other than a chance relationship between the psychiatrist's first grouping and his second.

2. Given that the two groupings are not independent then it is possible to examine whether any significant change has taken place in the classification.

3. It can also be shown what effect any change in grouping has on the discriminating power of the tests and if such effect is consistent with the hypothesis of "indirect contamination".

Of the 102 cases in the sample, 75 individuals remain in the same category on the second occasion as they occupied on the first. The obtained relationships are clearly shown in Table II.

TABLE II

		Those Diagnosed on the First Occasion as:			
		Functional	Doubtful	Organic	Total
Those Diagnosed on the Second Occasion as:	Functional ..	47	14	6	67
	Doubtful ..	5	10	2	17
	Organic ..	0	0	18	18
	Total	52	24	26	102

The relatedness of the two groupings was tested in the manner described by Garrett (3): "χ^2 test of independence in contingency tables." The χ^2 value is 76·45 with df equal to 4, a value significant at beyond the ·01 level. The two

sets of data must, therefore, be regarded as related. These results serve to confirm the reliability of the psychiatrist's diagnosis as between these three groups after a period of one year, this reliability being of the order of 75 per cent.

As it has been shown that the two sets of data are related, it is then necessary to examine if any systematic change has taken place in the grouping on the second occasion as compared with the first sorting. Unsystematic variation alone would be expected to cause approximately as many individuals to be displaced in any one direction as in another. That is to say the number of individuals whose diagnosis changes from "doubtful" to "functional" should be the same as the number changing from "doubtful" to "organic". An alternative to this null hypothesis, however, was formulated by Inglis as a result of reading the case notes. This alternative hypothesis predicted that the flow of change would be significantly greater in the direction of "functional" diagnosis, away from both "doubtful" and "organic" groups. The reason for such an expectation is as follows. If the patient had, on the first occasion, presented enough "objective" evidence of brain damage (such as abnormal neurological findings strongly indicative of pathology) he was placed in the "organic" group. Any impression of apparent preservation of cognitive efficiency did not then seem to influence the diagnosis towards the "doubtful" or "functional" categories. If, however, an individual showed few or none of these objective signs, but at the same time, his efficiency of mental functioning seemed impaired, then this fact *did* appear to influence the diagnosis, making it more likely that he would be put in the "doubtful" or "organic" groups. It follows, if the suggested hypothesis is correct, that the reclassification of the patients, when impressions of cognitive and memory function are excluded, would cause the flow of change to take place mainly in one direction, away from "organic" towards "doubtful" and "functional", and from "doubtful" towards "functional". This hypothesis was tested on the data in the manner described by McNemar (9): "Test for change in correlated proportions." This technique gives a C.R. of 2·46 which, on a one-tailed test of significance (the direction of change having been predicted) is significant at beyond the ·01 level. This result permits confident rejection of the null hypothesis and confirms the alternative hypothesis that the influence of the clinician's impression of cognitive and memory function has served to bias the classification in favour of "organic" diagnosis. This result is also consistent with the hypothesis that the first investigation had produced a classification which had resulted in "contamination" of the data.

Analysis of variance of the group results on each of the tests was again undertaken in order to see what effect the changes in classification have on the discriminating efficiency of the objective tests.

It can be seen from Table III above that the group means for age are not significantly different. Some comments may also be made on other results.

(a) *Clinical Sensorium Test.* Of these measures which attempted to systematize the formal unstandardized procedures which were part of the routine psychiatric investigation only one of the six subtests, that of "Orientation" (i.e. for time and place) discriminated significantly between the group means: ·01 level. The test as a whole fails to differentiate between the group.

(b) *Clinical Questionnaire.* Of the measures which attempted to objectify the observations which lead clinicians to diagnose "memory impairment" two of the three subtests provide significant differences, i.e. "Memory for remote personal events" (at the ·01 level) and "Memory for recent general events" (·05 level), as does also the total score (·05 level). "Memory for recent personal events" fails to reach significance level.

TABLE III

	Functionals		Doubtfuls		Organics			
	M	SD	M	SD	M	SD	F	P
Age	66·90	5·60	69·25	4·88	69·77	8·65	1·97	—
(a) *Clinical Sensorium:*								
Orientation	5·95	1·60	5·69	1·78	4·35	2·52	5·13	XX
Name and address test	4·36	2·36	3·44	2·48	2·88	2·21	3·06	—
Logical Memory	7·25	3·82	7·34	4·37	6·15	4·78	0·53	—
Concentration	11·85	3·04	11·50	3·56	9·88	3·37	2·54	—
Arithmetic	2·72	1·45	2·75	1·44	2·12	1·93	1·09	—
Cowboy Story	3·39	2·28	3·09	2·33	2·91	2·71	0·31	—
Total: Clinical Sensorium	35·52	10·91	33·81	13·39	28·29	14·22	2·42	—
(b) *Clinical Questionnaire:*								
Memory for remote personal events	9·00	2·39	8·81	2·40	6·94	2·61	4·85	XX
Memory for recent personal events	7·31	2·16	7·31	2·58	5·77	3·25	2·77	—
Memory for recent general events	5·89	2·38	4·69	2·50	4·24	3·11	3·52	X
Total: Clinical Questionnaire	22·20	5·83	20·81	6·80	16·94	8·29	4·37	X
(c) *Memory Questionnaire:*								
Memory for time and routine	15·07	3·45	13·75	3·86	12·00	5·30	4·28	X
Memory for people on ward	10·92	6·85	8·88	7·01	6·59	7·58	2·70	—
Orientation on ward	12·21	2·71	11·93	3·15	9·24	4·24	6·22	XX
Total: Memory Questionnaire	38·20	11·03	34·56	12·46	27·82	15·15	4·98	XX
(d) *Psychological Tests:*								
Memory for 1st test session	8·68	2·88	8·16	3·35	6·50	3·21	3·47	X
Learning (NWLRT)	19·44	12·12	25·66	15·35	27·47	16·43	3·06	—
Retention Ia	8·43	2·20	8·63	3·92	7·40	1·74	1·33	—
Retention Ib	3·80	1·18	3·25	1·61	3·00	1·51	3·01	—
Retention IIa	6·67	2·62	6·38	4·29	4·82	3·11	2·47	—
Retention IIb	3·13	1·31	2·66	1·97	2·12	1·66	3·26	X
Bender Copy	19·43	3·40	19·38	4·02	15·24	4·47	8·82	XXX
Bender Recall	10·30	5·08	9·38	6·00	6·35	4·09	3·99	X
(e) *Intelligence Tests:*								
Vocabulary	9·62	3·26	10·19	3·82	8·71	3·69	0·80	—
Similarities	6·54	3·57	6·13	2·71	4·88	3·41	1·57	—
Picture Completion	7·61	4·15	8·44	3·48	5·88	4·81	1·69	—
Block Design	5·33	2·59	5·94	2·27	3·94	3·11	2·62	—
Total: Subtests (Pro-rated)	72·75	30·82	76·72	23·50	58·53	30·40	1·90	—

Key—Levels of significance: X = ·05; XX = ·01; XXX = ·001.

(c) *Memory Questionnaire.* Of the measures which attempted to make objective estimates of the kind of symptoms of "memory disorder" which would result in a relative taking the patient to see a doctor, two of the three subtests have significantly different means, i.e. "Memory for time and hospital routine" (at the ·05 level) and "Orientation on Ward" (·01 level), as does the total score (·01 level). The group means for "Memory for people on ward" are not significantly different.

(d) *Psychological Tests.* The kinds of tests the psychologist might use to investigate various aspects of "memory" show the following results.

1. "Memory for first testing session." On this test the difference between the group means are significant at the ·05 level.

2. "New Word Learning and Retention Test." The group means on the learning measure of this test are not significantly different. Only one item of the retention measures differentiates significantly between the means and that item at only the ·05 level.

3. "Bender Gestalt." The group means on this test are significantly different at a high level of confidence. In this respect the Copying test is the best item in the whole battery (·001 level). The recall test also differentiates (·05 level).

(e) *Intelligence Tests.* The means of the diagnostic groups on these tests are not significantly different.

The fact that there are fewer significant differences between the group means and the fact that the levels of significance which are obtained are lower, is consistent with the hypothesis that the results of the first investigation were due in part to the effects of "indirect contamination".

Discussion

1. The dual form of the investigation serves to show that the danger of "contamination of data" may arise in an "indirect" as well as in a "direct" way. That is to say the "direct" form of contamination may result when the individual who selects the groups whose characteristics are being studied has knowledge of the test results and uses this knowledge as part of the criteria for classifying the groups. "Indirect" contamination, however, may occur when part of the criteria for forming the groups consists in judgments or clinical impressions of the very variables which the tests given to these groups are attempting to objectify and whose relevance to such grouping the tests are being used to examine. This form of contamination can also produce good discrimination between the various groups according to test results without the functions assessed by the tests having any real relevance to the actual group differences. For example, suppose that it was desired to examine whether the presence of characteristic X had any relation to the existence of condition Y. To study this problem it would first be required to secure two groups, a group having condition Y (group Y) and a group not having condition Y (group not-Y). It can be seen that if the person sorting individuals into group Y and group not-Y used his "judgment" of the presence of X as one of his criteria for putting an individual into group Y and his "judgment" of the absence of X as one of his criteria for putting an individual into group not-Y, and, further, if his "judgment" concerning the presence or absence of characteristic X were good, then it would follow that any objective measure of X, given to these two groups, would show that characteristic X was possessed more frequently by the members of group Y than by the members of group not-Y. But, it can also be seen that this result would not answer the initial question as to whether characteristic X had any real relevance to condition Y. This question can only be answered when groups Y and not-Y are sorted initially without any reference to X and *then* the groups are tested for the presence or absence of this characteristic.

2. The data in this study, when freed, so far as possible, from the influence of contamination, fail to confirm, for patients of this group, the diagnostic value of certain clinical tests in common use, notably those procedures which were part of the routine psychiatric investigation, i.e. the Clinical Sensorium, including some which have long been accepted instruments of diagnosis, such as the "Name and Address Test" and the "Cowboy Story".

3. The results obtained on the tests included in the Clinical Questionnaire agree with the suggestion made by Jones and Kaplan (7) that "Ribot's Law" as applied to memory in the organic disorders of old age cannot be uncritically accepted, since, in the present investigation "Memory for remote events" in fact shows more significant differences between the group means than "Memory for recent events". It may be suggested, therefore, that the apparent preservation of memory for past events which is often described as characteristic of such elderly organic patients, does not stand up to objective examination. The possibility exists that the seemingly better memory for past events com-

monly mentioned, may be due to the fact that old people are uninterested in the present and tend to talk much more about the past.

4. Examination of the relationship of certain aspects of mental functioning to the psychiatric illnesses of old age confirms that performance on some tasks which appear to involve "memory" is relatively more impaired in the organic cases. The exact nature of the psychological functions involved in performance on such tasks remains to be investigated.

5. It can be inferred that the differences between the groups on these "memory" tests cannot be accounted for in terms of differences in intelligence alone, since the so-called memory tests have significantly different group means while the intelligence tests have not. This cannot, however, be interpreted to mean that these tasks necessarily have a "memory factor" in common. What causes the discrimination between the groups may be something quite specific to the individual tests. This problem remains to be studied.

6. It must be noted that the test which discriminates between the group means at the highest level of significance is apparently a test of perceptual function, i.e. Bender Gestalt. The nature of the psychological mechanisms underlying performance on such a task remains to be explored.

7. The amount of overlap between the group distributions on all the tests, even those showing significant differences between group means, is large. It is unlikely that any of the measures could be usefully employed as instruments of clinical diagnosis before they have been subjected to further investigation and refinement, except perhaps the Bender Gestalt test.

Summary

1. The aim of the research is to examine the relationship of certain aspects of mental functioning to the psychiatric illnesses of old age. The present paper has attempted to attack the problem of differential "memory function" by examining the discriminating power of certain test results as between "functional", "doubtful" and "organic" groups of elderly patients.

2. The design of the present study shows that spuriously positive results may arise from inadequate control over factors contributing to the selection of the criterion groups.

3. The investigation fails to confirm, for the patients tested, the diagnostic usefulness of certain tests in common use.

4. The results fail to confirm the predictions of "Ribot's Law" as applied to memory in these elderly patients.

5. The study shows significant differences between the means of the results of the psychiatric groups on some tasks which appear to involve "memory function". These differences cannot be accounted for merely in terms of group differences in general intelligence. The nature of the possible underlying "memory function" remains to be further examined.

6. The investigation so far shows that the best discrimination between the groups is achieved by a simple perceptual task (Bender Gestalt).

7. The study fails to show differences between groups on any of the tests which are sufficiently great to enable these tests to be immediately employed as useful diagnostic instruments.

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A REVIEW OF THE PSYCHOTIC ELDERLY RESIDENT IN A MENTAL HOSPITAL

By

G. I. TEWFIK, M.D., D.P.M.

Late Assistant Psychiatrist
Middlewood Hospital, Sheffield

A GERIATRIC unit containing 200 female and 110 male beds was fully opened at this hospital in March, 1953. There were then resident in hospital 226 females over 70, and 165 males over 65. The aim of this paper is to discuss the mental and physical health of the inmates and assess their medical and nursing requirements. It is hoped that this information will be of value to those intending to open similar units.

This hospital is unique in having a catchment area of over 1,000,000 and only 2,000 mental beds. Three hundred of these are taken by mental defectives, and 500 are over 65 years of age. There is a severe bed shortage with resulting delay in admission of elderly patients from the observation wards. The large initial death rate in the month following notification occurs mainly outside this hospital, and many patients are discharged from the observation wards without reaching the hospital. Admissions are restricted to those with severe conduct disorder. Thus the death rate and discharge rate will be lower than hospitals with a more fortunate bed-population ratio.

MENTAL STATE

Patients are divided into diagnostic headings according to the use of these terms in Henderson and Gillespie's *Textbook of Psychiatry*. Cases of paranoid schizophrenia and paraphrenia are grouped under the heading paranoid. The term dementia is restricted to patients with intellectual loss beyond their years and either no psychotic symptoms or only mild mood changes and unsustained irrational ideas.

Tables I, II and III summarize the present mental state of patients. Under the heading "psychosis" are four groups which were assessed according to the amount by which the patient's life is dominated by their mental illness. "Knowledge" is divided into four groups based on orientation.

Group 1. Full orientation and knowledge of present day events.
Group 2. Full orientation but loss of touch with recent happenings.
Group 3. Poorly orientated in time, and have only a hazy idea of their age.
Group 4. Those worse than Group 3. Many have no rational conversation, and fail to recognize their relatives.

Supervision is assessed as follows:

Group 1. Clean and tidy, able to look after themselves.
Group 2. Require general supervision to ensure cleanliness.
Group 3. Require dressing and washing.
Group 4. In addition to Group 3 have antisocial habits, e.g. hoarding, tearing, incontinence, eating swill, etc.

Some patients who are otherwise clean and tidy may hoard, and these are placed in a group lower than they would otherwise have been assessed.

Occupation:

Group 1. Occupied 4 or more hours daily.
Group 2. Occupied less than 4 hours daily.
Group 3. Occasional help and able to participate in ward activities, e.g. view television, attend church, etc.
Group 4. Unoccupied.

Schizophrenia. See Table I

The females are not so well preserved as the males, their psychosis being more often clouded by inertia. In spite of this they retain surprising ability to care for themselves. The majority of these patients have been in a mental hospital for more than 40 years.

TABLE I

	No.	Psychoses				Knowledge				Supervision				Occupation			
		Rec.	Rare	Part.	Tot.	1	2	3	4	1	2	3	4	1	2	3	4
Schizophrenia																	
Females	17	—	—	15	2	—	4	3	10	5	6	5	1	2	3	3	9
Males	12	—	—	7	5	2	3	6	1	7	4	1	—	7	3	—	2
Paranoid																	
Females ..	122	10	14	61	37	27	28	32	35	58	41	14	9	34	18	23	47
Per cent. females ..		8	11	50	30	22	23	26	29	48	34	11	7	28	15	19	39
Males	72	2	17	27	26	37	18	11	6	48	14	10	—	30	9	7	26
Per cent. males ..		3	23	37	36	51	25	15	8	66	19	14	—	42	12	10	36

Paranoid Illness. See Table I

The female patients are again more deteriorated than the males, particularly in knowledge, although their occupation and supervision data compares more favourably.

The majority of all patients of this age group in hospital suffer from paranoid delusions and auditory hallucinations. Their conduct has improved as the years have blunted their mental and physical powers, but they are still a cantankerous group who are readily incited to anger. Even those with no rational conversation still show their paranoid onset by noisy and aggressive behaviour.

Some mood disturbance is frequent in these patients and when it has been recorded on admission it is usually still obvious today. The mood disorder has had no effect on the ultimate prognosis of patients remaining in hospital. Disorientation on admission was recorded in 43 per cent. of females, and varies little with the age of the patient on admission. The mental preservation of female patients today is related to the age at which they were finally hospitalized. Fifty-five patients were last admitted between the age of 40 and 60, and 26 per cent. are now correctly orientated, 32 admitted between 60 and 70 years, 56 per cent. are now well orientated, and 34 admitted over 70 years, 68 per cent. are still well orientated. In the male patients, the duration of psychosis is not correlated with present mental deterioration.

Late paranoid illness is common in this hospital population. The symptomatology is identical with that in younger age groups and even ideas of pregnancy and sexual hallucinations occur after 70 years. The intellect remains well preserved and there is no reason to call this illness senile dementia.

Late paranoid illness in men is much less common in this hospital than in females, and is more often accompanied by mental and physical deterioration. This is confirmed by Roth (1955). E.C.T. has only a small place in the treatment of these patients. It has only been used in those who are extremely disturbed or those with a well marked affective component. Two patients have periods of elation and confusion super-added in their paranoid psychosis and return to

their usual state with a short course of E.C.T. Two elated grandiose patients have been maintained on fortnightly E.C.T. or otherwise are noisy, violent, and resistive. Eight depressed paranoid patients have been treated and have all initially improved. Five have maintained this for periods up to six months before relapsing. Further courses of E.C.T. have not produced such lasting improvements and have been abandoned.

E.C.T. is of particular value when one patient's conduct is upsetting the whole ward atmosphere. Refusal of food is also a symptom which has always responded to treatment.

Depression. See Table II

This is not a dementing illness. Both males and females show similar assessments for knowledge and supervision, although the females are better occupied. Of 77 patients of both sexes, 50 recovered, 31 without treatment, 16 following E.C.T., and three following E.C.T. and leucotomy. Of the 24 remaining depressed, 16 have had adequate treatment with E.C.T. In two patients E.C.T. was discontinued because of prolonged apnoea, and collapse after treatment. Of the disorientated patients, one is still agitated and restless. She has had three previous admissions for depression, but over the last two years has been disorientated, and now cannot recognize her relatives. A course of E.C.T. still causes great relief to her misery and agitation, but she requires further courses at six monthly intervals.

Twenty-four out of 39 female patients were recorded as being well orientated on admission. Sixteen of these have recovered and 22 remain orientated. Seven patients were disorientated in time on admission, all are now well orientated and five have recovered. Eight patients were disorientated in time and place on admission, seven are now well orientated, and four have recovered. Thus disorientation in elderly depressed patients does not indicate dementia or a poor prognosis.

With adequate treatment depression is a small problem in geriatric wards. Many patients are retained through housing shortage or incompatability with relatives. The illness of the others is mild and the patients easily manageable.

TABLE II

	No.	Psychosis				Knowledge				Supervision				Occupation			
		Rec.	Rare	Part.	Tot.	1	2	3	4	1	2	3	4	1	2	3	4
Depression:																	
Females	.. 39	11	14	5	9	24	11	2	2	26	6	6	1	20	9	3	7
Males	.. 38	15	11	7	5	28	6	3	1	28	7	2	1	14	7	8	9
Mania:																	
Females	.. 7	1	4	–	2	6	—	1	–	4	3	–	–	4	–	2	1
Males	.. 10	—	5	3	2	5	3	2	–	5	3	2	–	6	2	2	–

Mania

Seventeen patients. Four of these also have periods of depression. Males and females are in a similar state of preservation, although the illness is more severe in males. Six patients (4 females, 2 males), have chronic hypomania, but the other eleven have attacks of acute mania. One lady was admitted over 70 years old for periods of mania occurring 2–3 times yearly. These attacks have continued regularly, and in some she has nearly lost her life from pulmonary infection following exhaustion due to restlessness. She is now aged 88, and for the last two years her mania has been controlled by 3–4 E.C.T.s at the onset of a relapse. Five of the 8 males with recurrent mania also require E.C.T. otherwise havoc results from fights, blocked lavatories and similar mischievous aggression.

Case 1. Single retired school teacher aged 72. She has had three previous breakdowns, two for mania and one for depression, with admissions lasting 1–2 years.

She was admitted with severe agitated depression, was disorientated, untidy, refused food, and was emaciated.

She was treated with eight modified E.C.T.s over four weeks and was soon normal, well-orientated and had gained weight. She then developed an intense confusional state, did not speak, was tense, agitated, resistive and refused all food. Three further E.C.T.s appeared to make her worse. She was given an intravenous vitamin mixture (Gould, 1953) with no effect, and for three months was a severe nursing burden. She gradually improved and began to eat, but remained confused, and her mood changed to elation. She remained in hypomania for one year before E.C.T. was tried again. She was then well nourished. After six E.C.T.s over four weeks she became normal. She remained well for 4/52, but again a tense confusional state recurred similar to that described before. She has now returned to hypomania. Roth (1951) gives a warning that E.C.T. in the malnourished may precipitate confusion from vitamin loss but this cannot explain the above.

Three males have "folie circulaire" with regular cycles. They are well preserved for their years.

Dementia

Thirty-eight patients, 29 females and 9 males. Owing to the recent bed shortage, cases of simple dementia are only admitted where there is severe conduct disturbance. This has restricted the admission of simple dementia and excluded post-apoplectic dementia apart from in one case.

Of the 29 female patients present in March, 1953, seven were admitted under the age of 70. On admission six showed some retention of orientation. Thirteen of these are over-active and wander restlessly most of the day. These are known to the nursing staff as "the happy wanderers". They tend to accompany others collecting papers and rubbish, and to annoy the stronger paranoid patients. Some keep watch on the doors and readily escape. The majority are incontinent. Some appreciate nature's call but use an inappropriate place, e.g. a shoe, locker or bath. Many strip themselves of clothing and will not rest even when they are seriously ill. Emotional lability of the degree found in gross neurological cases is present in only one patient. Lesser degrees of emotional lability are not diagnostic and are found in epileptics, mental defectives and affective illnesses.

TABLE III

		Knowledge				Supervision				Occupation			
	No.	1	2	3	4	1	2	3	4	1	2	3	4
Dementia:													
Females ..	28	–	2	5	21	–	6	7	15	–	7	3	18
Males	7	–	–	2	5	–	2	2	3	–	1	–	6
Epilepsy:													
Females ..	5	2	2	–	1	2	3	–	–	2	2	1	–
Males	12	4	6	1	1	7	3	2	–	6	1	3	2
Mental Defect:													
Females ..	7	–	1	3	3	2	3	–	2	1	2	–	4
Males	8	–	3	2	3	2	3	2	1	2	2	2	2

Two males and one female remain in hospital having recovered from a confusional episode.

Epilepsy and Mental Defect

As in most hospitals, there are more males with epilepsy and mental deficiency than females.

Perusal of their case records shows there has been little deterioration in their condition through the years. Fits are now rare. Defectives are better

employed than psychotics of similar degree of orientation. Fifteen female patients have major fits. Five of these were admitted with a diagnosis of epilepsy, six were admitted for senile dementia, four for a paranoid psychosis.

G.P.I.

Only two males have reached the age of 65 at this hospital. Both are well preserved and excellent company.

Admissions

There are too few patients to make a detailed survey of individuals valuable. Seventy is a level beyond which the prognosis of mental illness rapidly becomes worse. The male side have many discharges in their 65–70 age group. There were 43 females admitted from March, 1952–October, 1954, ten with depression, 15 with a paranoid illness, 17 with dementia, of these 1, 3 and 4 respectively have since died. Seven females only have been discharged, six with depression and one with a paranoid illness. Of 15 patients admitted between March, 1953 and October, 1954, ten were depressed and all of them have been discharged. Six patients recovered after E.C.T. alone, two agitated cases after E.C.T. and leucotomy. Two retarded cases are maintained on fortnightly out-patient E.C.T. at the geriatric O.P. Department.

Patients have been treated in this department for the last four months where advice and treatment including out-patient modified E.C.T. is given to frail and elderly cases. The shortage of hospital beds has necessitated all mild cases being treated by the out-patient department, and approximately 2,000 electrical treatments were given during the year 1953 in the hospital catchment area.

At this hospital we feel that there are many advantages in this policy, and providing relatives are kind and understanding and the home atmosphere is not a major factor in their illness, the patient is best cared for by the individual affection that only relatives can give. At home there is quiet, ideal occupational therapy and absence of a stressful psychotic community. Discharge difficulties do not arise, stigma is avoided, and return to work occurs earlier.

With an active O.P., E.C.T. Department in-patients can be discharged earlier and with greater confidence. One patient aged 75 who had had severe mania for eighteen months has been out of hospital for over a year, with the help of two or three E.C.T. every six months.

Death Rates

Two hundred and twenty-eight patients were present on 1 March, 1952. Of these 19 had died by 28 February, 1953. The expected death rate calculated from the Registrar-General's report for 1952 was 17·4. Two hundred and thirty females were present on the same date in 1953. Twenty-five died over the year. The expected death rate was 18·3. The increase in expected death rate of the year 1953–54 over the 1952–53 year, is due to ageing of the hospital population through restriction of admissions. One hundred and sixty-five males were present in March, 1953, seventeen died during the year instead of the expected eleven. If the cases of dementia are excluded, then on the female side 205 patients were present in March, 1952, of whom eleven died, the expected death rate being 15·6. During the following year 199 non-dementia patients were present, 15 of whom died, the expected death rate was 16·0.

Thus in spite of the considerable mental deterioration of the schizophrenic

and paranoid patients, there has been a normal death rate for the last two years in this group. Cases who suffered from constant paranoid delusions and auditory hallucinations, were not diagnosed dementia, even if the patients were over 70, and disorientated on admission. Of 45 non-demented patients admitted over the age of 70 before 1 March, 1952, one died in the first year, and four in the second, leaving forty patients in March, 1954. This is below the expectation of death for the general population.

Demented Patients. Of 33 cases of dementia present in March, 1952, eight died in the first year, and eight in the second, leaving 17 survivors on March, 1954. Of those who died two were over-active and fourteen passive. The average duration of stay in hospital of the demented patients before death was 4·4 years, with extremes of 6 months to 11 years. It is surprising that the over-active dements have fared better than the passive ones in spite of their greater exposure to injury. The over-active ones remain slim as opposed to the obesity general in the passive cases.

Five other patients who died between March, 1952–54 have not been included in the survey as they had not been admitted before the census dates, and had died before the next date. Three were demented (one over-active and two passive), and two had paranoid states.

Roth and Morrissey (1952) in a survey of patients over 60 admitted to Graylingwell Hospital, state that almost 60 per cent. of patients with dementia died in the first 6 months, and over 80 per cent. over 2 years. O'Connell (1953) states that 45 out of 64 patients admitted to Crichton Royal Hospital were dead after two years. The discrepancy between these reports and the present survey can be explained by the method of admission. Where there is direct admission to the Mental Hospital the death rate is highest. Here, with the delay in admission from the observation wards, the large initial death rate has occurred prior to admission. In the Graylingwell figures the death rate falls off sharply after the first six months in hospital. The high death rate following notification of a case of dementia is probably due to physical decline bringing the plight to the notice of the general practitioner, and is not the primary result of the mental illness. Cook, Dax and Maclay (1952) reviewing 510 admissions to six mental hospitals found the death rate compared with that of the general population fell from 1 : 24 in the first six weeks to 1 : 1·3 from six months to one year.

Males. There is insufficient information to present the results in the same detail as the female cases. Of the 17 males who died only two were diagnosed dementia. They had been in hospital 7 and 8 years. Dementia is a much less common illness in the males of this hospital. In spite of this the death rate remains above that of the general population. Post (1951) also noted a higher death rate amongst males with mental breakdown. Sheldon's observation (1950) that females "in spite of their increasing decrepitude have a power of sheer survival that is denied the men", also holds for mental illnesses.

Table IV shows admissions, deaths and discharges 1949–53 in this hospital.

TABLE IV

Year	Admissions	Discharged	Deaths	No. of Patients
1949	992	830	170	2,045
1950	924	766	151	2,052
1951	795	663	141	2,043
1952	725	588	110	2,070
1953	685	584	84	2,087

This illustrates the result of overcrowding in a hospital. Admissions are restricted; deaths and discharges fall; the hospital problem becomes intensified.

Physical State

Statistics are given for the incidence of some common ailments in 225 females over 70 and 167 males over 63, and records are made of those who died in the year following this assessment. Twenty-five females and seventeen males died. Only tentative conclusions about the mortality of the ailments can be given.

The figures are compared with those recorded by Sheldon (1948) in his review of 451 cases (males over 60, females over 65) of the old people of Wolverhampton residing at home, and Affleck's (1947) review of chronic sick in hospitals in Leeds. The relevant percentages given in brackets are from Sheldon, unless otherwise stated.

Many of the patients here are unable to give any history, and the minor manifestations of their ailments may have escaped observation.

Bronchitis (i.e. chronic productive cough, with acute episodes)

Eighty-one or 36 per cent. (38·7 per cent.) females of whom 20 died in the year following; 51 or 31 per cent. (46·6 per cent.) males of whom 6 died in the year following.

Affleck gives a 10 per cent. incidence in both sexes.

Oedema of the legs (i.e. persistent oedema or frequent occurrence of oedema followed by recovery)

Sixty-four or 28 per cent. females of whom one died; 68 or 41 per cent. males of whom 9 died.

Sheldon records incidence of 3 per cent. in males and females. The considerable increase in this survey may be due to mental inertia causing immobility, but Sheldon's figure is surprisingly low. Physical examination of his cases would perhaps have revealed a greater incidence.

Arthritis (i.e. restriction of joint movements serious enough to interfere with mobility or employment)

Forty-four or 20 per cent. (35 per cent.) females of whom 5 died; 47 or 25 per cent. (24 per cent.) males of whom 3 died.

Falls (i.e. falling to the ground without ability of the patient to adjust balance normally. This includes neurological, cardiovascular, labyrinthine and toxic causes (e.g. a fall always heralded an attack of cellulitis of the leg in 2 patients))

Sixty-six females or 29 per cent. (43·4 per cent.) of whom 5 died; 14 males or 8 per cent. (21·1 per cent.) of whom 5 died.

Falls are less frequent here than in the general population. The patients are less active. Lifts are used to avoid stairs whenever possible, and careful attention has been paid to prevent irregularities in the flooring or projections from corners of passages.

Vaginal Discharge (i.e. sufficient to soil clothing)

Twenty-seven patients, 6 severe, 15 moderates and 6 slight. Nine patients have since been treated with stilboestrol lactic acid pessaries and seven have improved.

Locomotion. This is divided into four groups

(1) *Nil or chair ridden.* Ten females or 4 per cent. of whom 6 died (Sheldon 8 per cent. bedfast; Affleck 41·7 per cent.); 4 males or 2 per cent., of whom 4 died (Sheldon 4 per cent. bedfast; Affleck 33·9 per cent.).

Of the chair ridden females, three are blind and demented, two have failed to rehabilitate from fractured femur. One had a recent stroke, two have contractures from rheumatoid arthritis, one has chronic heart failure, another is obese and has frequent bronchitis.

The chair ridden males were all near to death, one had a fractured femur and a recent stroke, another Parkinson's disease, the other two general deterioration. At the time of writing there are no chair ridden male patients, over 65 years.

(2) *Assisted*, i.e. by aid of nursing staff or are able to use wheel chair or walking apparatus. Fifteen females or 6 per cent. of whom 3 died (Affleck 44·7 per cent.); 4 males or 2 per cent. of whom 2 died (Affleck 45·8 per cent.).

(3) *Tottery.* Thirty-nine females or 17 per cent. of whom 5 died; 38 males or 17 per cent. of whom 4 died.

(4) *Fully ambulant.* One hundred and sixty-one females or 72 per cent. of whom 11 died (Affleck 20·3 per cent.); 130 males or 78 per cent. of whom 7 died (Affleck 13·6 per cent.).

The ambulancy figures depend almost entirely on hospital policy, e.g. Brocklehurst (1951) states—A few years ago almost the entire population of 500 patients was completely bedridden. A proportion of these were allowed to go to toilet, but no provision was made for them to remain up. At the time of writing 25 per cent. are on their feet for varying periods during the day. Thompson (1948) from Birmingham reports 943 out of 1,083 patients bedridden, but only in 5 per cent. was there any hope of rehabilitation. He suggests this figure is due to restricted staff as "the labour of getting them out of bed and caring for them when up was greater than that of cleaning them every four hours".

The "hard core" of non-ambulance is very small in this hospital.

Major Fractures (i.e. femur or humerus)

Eleven females or 4 per cent. of whom 3 died; 3 males or 2 per cent. of whom 1 died.

Blood Pressure

Figures in brackets are from Howell's review of 340 healthy pensioners followed by Brocklehurst's review of 100 incontinent patients.

(1) "*Normal*", i.e. systolic pressure below 160 mm. hg. Fifty-three or 24 per cent. females of whom 10 died; 62 or 38 per cent. males of whom 7 died (Howell 20 per cent.; Brocklehurst 36 per cent.).

(2) *Mild hypertension*, i.e. systolic pressure between 160 and 200 mm. hg. One hundred and three or 46 per cent. females of whom 10 died; 80 or 48 per cent. males of whom 7 died (Howell 55 per cent.; Brocklehurst 43 per cent.).

(3) *Hypertension.* Systolic pressure over 200 mm. hg. Sixty-nine or 31 per cent. females of whom 6 died; 23 or 14 per cent. males of whom 2 died (Howell 25 per cent.; Brocklehurst 21 per cent.).

The figures here resemble Brocklehurst's incontinent patients rather than Howell's pensioners. Probably this indicates a frailer hospital population. Deaths here are more frequent amongst those with "normal" blood pressure.

Vision

(1) *Normal*, i.e. able to read small print with aid if required. One hundred and twenty-three or 54 per cent. females of whom 18 died; 100 or 61 per cent. males of whom 10 died.

(2) *Poor Vision*, able to read large print only, with aid. Eighty-six or 38 per cent. females of whom 7 died (Affleck 2·9 per cent.); 60 or 36 per cent. males of whom 6 died (Affleck 8·1 per cent.).

(3) *Blind*, vision reduced to ability for finger counting or worse. Sixteen females or 7 per cent. (1 per cent. Sheldon) of whom 0 died (Affleck 4·5 per cent.); 5 males or 3 per cent. (1 per cent. Sheldon) of whom 1 died (Affleck 3·1 per cent.).

Hearing

(1) *Normal*, able to hear normal conversation. One hundred and thirty-eight females or 61 per cent. (71·4 per cent. Sheldon) of whom 14 died; 105 or 64 per cent. males (62·5 per cent. Sheldon) of whom 11 died.

(2) *Mild Loss*, able to hear directly spoken raised voice. Sixty-five or 29 per cent. females of whom 10 died (Affleck 5·6 per cent.); 45 or 27 per cent. males of whom 4 died (Affleck 8·1 per cent.).

(3) *Severe Loss*, stone deaf, i.e. require the shouted voice close to the best ear for comprehension. Twenty-two females or 10 per cent. of whom 1 died (Affleck 7·8 per cent.); 15 males or 9 per cent. of whom 2 died (Affleck 7·2 per cent.).

Blindness and deafness are more frequent here than in the general population. There is also an increase over figures for chronic sick hospitals. Sensory loss is probably a factor in the aetiology of senile psychoses.

Incontinence

Fifty-seven patients, 45 females or 20 per cent., 11 males or 8 per cent. These are divided into the following groups:

(1) *Total Incontinence*, i.e. urinary and faecal incontinence in which the patients rarely give a warning to the nursing staff. Fifteen patients (26 per cent.), 14 females, 1 male.

(2) *Partial Incontinence*, mainly urinary, more rarely faecal, with occasional correct anticipation by the patient. Eight patients (14 per cent.), 6 females, 2 males.

(3) *Faecal Incontinence*. Five patients (9 per cent.), 2 females, 3 males.

(4) *Urinary Incontinence*, day and night. Fourteen patients (24 per cent.), all female.

(5) *Urinary Incontinence*, night only. Fifteen patients (or 26 per cent.), 10 females, 5 males.

Table V gives details of the knowledge level and ambulancy in their group.

TABLE V

		Knowledge				Ambulancy			
	No.	1	2	3	4	Normal	Tottery	Assisted	Chair Ridden
Total urinary and faecal	15	–	1	1	13	—	4	5	6
Partial urinary and faecal	8	–	2	1	5	2	3	–	3
Faecal	5	1	2	—	2	3	2	–	—
Urinary, day and night ..	14	2	1	2	9	7	6	–	1
Urinary, night	15	1	1	6	7	11	4	–	—
	57	4	7	10	36	23	19	5	10

Total Incontinence. The brighter two patients with total incontinence are both depressed and agitated. E.C.T.s temporarily improve their mental condition and relieve their incontinence but improvement has only been maintained with weekly treatment and has been abandoned.

Partial Incontinence. The two better orientated patients were both chair ridden. One has contractures of her knees and sometimes tries to shuffle to the toilet on her bottom. The other is a chronic schizophrenic whose knowledge was surprising.

Faecal Incontinence. Food upsets usually precipitate mistakes. Two patients have local rectal lesions, and another is depressed, with a delusion that her bowel is blocked up. Her incontinence is due to her attempts at manual relief. Her condition was relieved for only a short period following a course of E.C.T.

Urinary Incontinence, day and night. Three patients have cough incontinence and are fairly well orientated. The other bright patient had a stroke one year ago and has little function on the affected side. She is chair ridden.

Nocturnal Urinary Incontinence. One female has a normal intelligence, and the cause of her incontinence has never been discovered. The male patients are somewhat brighter than the females.

The major cause of incontinence here is a combination of gross mental impairment and difficulty in the patient reaching toilet facilities through physical frailty. Ambulant demented cases are usually incontinent only at night, all chair ridden patients are incontinent. Local lesions are responsible for only six patients and depression for three patients. Urine abnormalities were no more frequent in the incontinent than in the other patients. Providing satisfactory ambulation is maintained, incontinence is a late feature of mental deterioration.

Fifty-two per cent. of females and 24 per cent. males are moderately or totally disorientated.

Sheldon's figures for incontinence in the general population were 12·7 per cent. females and 7·4 per cent. males.

Brocklehurst (1951) recorded the following details from Foresthall Hospital, Glasgow, where there are 600 beds for chronic sick:

18·3 per cent. males and 33·3 per cent. females were incontinent. Thirty-eight per cent. of patients were confused.

Double incontinence was present in 72·4 per cent., faecal only in 2·9 per cent. and urinary in 24·7 per cent. 69·6 per cent. were continuously, i.e. more than five times daily, 20·8 per cent. incontinent one or more times daily and 7·7 per cent. occasionally incontinent, and 1·9 per cent. nocturnal incontinence only.

Thompson (1949), from a Birmingham chronic sick hospital, reported that of 943 bed-ridden patients 25 per cent. males and 44 per cent. females were incontinent.

Affleck (1947) from Glasgow reported from a hospital of 788 beds (236 males and 552 females) 13 per cent. were under the age of 60 years and 37 per cent. showed "Mental" symptoms. 23·8 per cent. males and 24·2 per cent. females were incontinent.

Relationship of Mental Condition to Physical State

(1) *Correlation of Paranoid Illness and Special Sensory Loss*

Males over 65, females over 70 were assessed using the criteria of sensory loss described above. Sensory loss is slightly more common in female patients with paranoid illnesses, but this difference was not found in males.

TABLE VI

	No.	Vision			Hearing		
		Normal	Poor	Blind	Normal	Poor	Deaf
Paranoid females	118	57	50	11	63	40	15
Per cent. ..		48	42	10	53	34	13
Non-paranoid females ..	130	84	38	8	89	34	7
Per cent. ..		65	29	6	68	26	5
Paranoid males	79	48	28	3	51	19	9
Per cent. ..		61	35	3	65	24	11
Non-paranoid	102	63	36	3	66	30	6
Per cent. ..		62	35	3	65	29	6

(2) *Relationship between Blood Pressure and Dementia*

TABLE VII

	No.	Below 160 Systolic	160–200 Systolic	Over 200 Systolic
Dementia females	43	17	19	7
Per cent.		40	44	16
Non-dementia females ..	178	34	84	60
Per cent.		19	47	34
Dementia males	9	4	4	1
Per cent.		44	44	11
Non-dementia males ..	142	53	69	20
Per cent.		37	49	14

This lowering of blood pressure in demented patients is against generalized vascular occlusion being other than a small factor in their illness.

In 21 epileptics admitted over the age of 60 suffering from various psychoses, nine had normal blood pressure, twelve had systolic pressure between 160–200. This is again a lowering from the normal rate for this hospital population.

Casualties

In this hospital all accidents which occur are reported by the staff, and patients are seen by the doctor, even if no marks or symptoms of the accident are present.

From March, 1953 to March, 1954, in the geriatric unit (200 females, 110 males) 145 accidents were noted, 96 females and 49 males, involving 66 females and 36 males. There were six fractures, three femurs, two ankles, and one nose. The causes of these injuries are divided into the following groups:

1. *Normal.* Where it was considered the patient's state had little to do with the injury—22 injuries, 20 females, 2 males.

2. *Fainting Attacks.* Injuries due to loss of consciousness or giddiness. As there is no adequate history from the patients it is impossible to sub-divide this group. Five (four females, one male) were due to epilepsy. Forty-seven injuries; 29 females, 18 males.

3. *Weakness.* Accidents without loss of consciousness or giddiness which

are thought to be due to the patient's inability to correct posture, e.g. during walking exercises—16; eight females, eight males.

4. *Restlessness.* Injuries due to psychomotor activity in frail patients causing accidents—nine; eight females, one male.

5. *Trip.* Patients who shuffle their feet falling against carpets and chairs. Four females and one male.

6. *Aggression.* Injuries from punching, scratching, pushing etc.,—42; 25 females, 17 males.

7. *Sleep.* Four casualties were caused by patients toppling out of chairs when asleep.

Three patients had six injuries, two had four injuries, three had three injuries, and seventeen had two injuries during the year.

Of the eight patients with three or more injuries, three had fainting attacks, three were frail and very restless patients, and two were weak. One of these had tabes dorsalis and was endeavouring to walk. The fractures occurred from fainting attacks (three patients), restlessness (two patients) and aggression (one patient).

Some Notes on the Geriatric Unit and Its Management

The geriatric unit (200 females, 110 males) is housed in an old hospital building which has been converted for the purposes following the exit of a wartime surgical unit.

There are three floors connected by a lift. The ground floor contains two wards for the frailer 75 female and 43 male patients, and is separated by a central kitchen. The first floor has two wards for 125 female and 67 male ambulant patients. These wards are separated by a central common room which is used during the day for mixed occupational therapy, and in the evening as a lounge in which are held entertainments. The second floor contains only dormitory space.

The areas of floor space used by patients in the day are—Ground Floor, 75 females, 3,340 square feet; 43 males, 1,742 square feet. First Floor, 125 females, 3,364 square feet; 67 males, 2,879 square feet. Central Common Room, 1,978 square feet.

The area of floor space used for dormitories are—Ground Floor, 42 females, 2,540 square feet; 42 males, 2,208 square feet. First Floor, 35 females, 2,132 square feet. Second Floor, 117 females, 7,597 square feet; 64 males, 2,879 square feet. Ten patients sleep in side rooms.

There is a large airing court shared by males and females, laid out for clock golf and bowls.

Nursing Staff

A three shift system is used (6 a.m.–2 p.m., 2 p.m.–10 p.m., and 10 p.m.–6 a.m.). On each day-shift two sisters and seven nurses look after the 200 female patients, and two charge nurses and three nurses look after the 110 males. At night five nurses are employed on the female side, and two on the male. One porter, four full-time and two part-time cleaners help on the female side. The male staff is unaided.

Ward Routine

Fit patients get up at 6 a.m., approximately 25 frail patients get up at 9.30 a.m. All patients are dressed apart from three incontinent patients who

wear dressing gowns and pyjamas. Conduct problems are frequent at this time. Paranoid and depressed patients are particularly difficult. The frail are at their most unsteady, and confusion is usually maximal on waking. Frail patients return to bed between 3.30 and 5.30 p.m. Incontinent patients are taken to toilet or commode five times during the day and three times at night.

Supervision

Forty-nine per cent. of males and 27 per cent. of females look after themselves completely. Twenty-four per cent. males and 21 per cent. females require general tidying up, 16 per cent. of males and 20 per cent. females require washing and dressing toilet attention, and 10 per cent. males and 32 per cent. females require every attention and have antisocial habits such as hoarding, tearing clothes, incontinence and eating swill and rubbish. Fifteen patients require help with feeding. Of the 110 males, 50 shave themselves.

Conduct

Seventy-eight per cent. of males and 58 per cent. females give no trouble, and are fully co-operative, 19 per cent. males and 22 per cent. females are noisy. Twenty-one per cent. males and 16 per cent. females are aggressive at times. Three per cent. males and 16 per cent. females wander. Nine per cent. males and 16 per cent. females interfere with other patients, and 2 per cent. males and 24 per cent. females are occasionally resistive of nursing attention. Noisy and aggressive conduct mainly occurs in paranoid patients, wandering, interfering and resistance is most commonly associated with dementia. Discipline by privilege withdrawal is necessary to prevent weaker patients being exploited by the strong. Patient co-operation on the male side is good. The minority of unruly patients are dominated by the co-operative ones, and their nurses are well in control. An order such as "Stand for Grace" is obeyed. The females are individualists—there is little communal discipline, and they therefore require much more individual attention.

Sickness

At any one time there is an average of four females and two male patients in bed. Two days' rest in bed is frequently prescribed, and is rarely refused if requested. Patients are usually anxious to get up as soon as they feel better. Three weeks is a time beyond which it is very rarely justified to retain a patient in bed. Drugs are used sparingly. I do not use digitalis and antibiotics in the treatment of pulmonary sepsis and heart failure in demented patients, as I feel it is unkind to retain the patients to the last stages of physical and mental decrepitude. Eighty-seven patients take aperients, 17 require weekly enemata to reduce faecal incontinence. Faecal impaction has only occurred on one occasion over the last $2\frac{1}{2}$ years following melaena.

Occupation

Forty-two per cent. males, 28 per cent. females are occupied four or more hours daily, 16 per cent. males and 16 per cent. females are occupied 2–4 hours daily, 14 per cent. males and 16 per cent. females help occasionally and join in the social life. Twenty-eight per cent. males and 40 per cent. females are unoccupied. One hundred and twenty patients help on the ward, and 60 attend occupational therapy. Unless there is any physical handicap, patients can occupy themselves to a similar degree as they are able to look after their

person. Tidy patients who are unoccupied are rare, they usually have delusions of persecution and grandeur.

Recreation

Approximately 70 attend social evenings, cinema, whist and domino drives, and religious services which are held each week. A bible class is held weekly in which patients read verses aloud. The elderly cling to religion, and the chaplain can draw as large a gathering as attend the entertainments. Local amateur bodies present regular live shows on a stage which can be moved to each ward. Local Sunday Schools and Dancing schools have brought children's entertainments which are particularly popular.

A library trolley visits each ward.

Other points which help to maintain a therapeutic atmosphere include:

(1) *Ward Appearance and Furniture.* A hospital can never look like home, but home touches can be introduced providing they do not interfere grossly with ward hygiene. The pictures used are mainly railway posters glued to the wall and varnished. They are decorative, can be washed with the wall, and do not fall or break. Wall vases out of reach of demented hands prevent flowers being hoarded and eaten, and save breakages. Anodized metal vases are used on mantel-pieces and tables. Patients are encouraged to have photo frames of their relatives or animals on their bedside lockers.

Mirrors are decorative and help to keep the patients tidy. They are placed in corridors, day rooms and dormitories, so that even the shortest patients can admire themselves. Cabinet type lockers placed in the corridors are essential for the more intelligent. Security of valuables, books and writing materials is necessary as nothing is safe from the many patients who hoard. More responsible patients can then have their own brushes, combs and tooth brushes, and thus require less supervision.

(2) *Dress.* Dress of patients can do a great deal to help or ruin morale. Patients are encouraged to wear their own personal clothing and spend their money buying useful articles instead of food. Men particularly take much more care of personal clothing.

"Home Perms" are used particularly after leucotomy and before leaves and discharge.

(3) *Visiting.* The visitor is the patients life-line. The possibility of discharging a recovered or improved patient depends largely on the attitude of the relatives. Much thought is necessary to maintain their interest. It is difficult to maintain the morale of unvisited patients if they feel neglected.

A Visitors Association was started here in November, 1953, with the following aims:

(*a*) To ensure that each patient who is able to appreciate a visit is visited. Where 2 or 3 friends visit one patient, they are approached to visit another also. Volunteer visitors have been canvassed from the general public, by press publicity, and approach to churches and voluntary organizations. Some patients can sustain a conversation for only short periods, but nevertheless appreciate a fresh face and a small gift; these are grouped into four and visited by one volunteer.

(*b*) Transport for elderly visitors to the hospital is provided by others travelling by car from the same area.

(*c*) Volunteers are asked to answer patients' letters and acknowledge parcels received from friends who live far away and rarely visit.

(*d*) A pool of money was collected to help finance ward decorations, coach tours and birthday presents for all patients. Relatives who pay a small sum are encouraged to go with patients on outings. This adds to patients' enjoyment, increases supervision and stops a "crocodile" appearance of the party.

(*e*) To further the visitors' co-operation a meeting was called and an effort was made to explain patients' behaviour and ask that visitors should not be repulsed by paranoid patients' anger and obscenity. Types of gifts were discussed and a plea was made that obese patients should not be overfed.

Nursing Staff

The unit depends on the enthusiasm of the nursing staff, and the pleasure and satisfaction they gain from their work. The points mentioned above all help in this, and a large portion of the ward decorations have been provided by the nursing staff. Mixing of male and female patients also brings the nursing staff together, and avoids the frigidity of many hospital wards. Lectures are given by the medical staff to senior nurses to keep them in touch with modern methods.

Discussion

It is a tragedy that the appalling conditions reported by Thompson and Brocklehurst and others from the chronic sick hospitals are still with us today. This is not due to Nursing Staff shortage. Thompson gives an average of four trained nurses and 21 other nurses and 22 domestic workers for each 100 beds in the hospital group he was discussing. Here there are four trained, five other nurses and 2 domestics per 100 beds in the geriatric unit.

The mental hospitals have advantages over chronic sick hospitals in that there is adequate day room space, and large wards where many can be supervised by the few. The mental hospital attitude that all patients are expected to help in some measure is essential for their success in nursing and occupation. This hospital is by no means unique, and the nursing situation is more favourable than some. Cross (1954) reports that one-tenth of male patients and one-eighth female patients are bedridden in the mental hospitals of one area. This attitude is exceptional in my experience of mental hospitals.

Specific Treatment

E.C.T. I have treated 57 females over 70 years and 36 males over 65 as in-patients, and one female and eight males of the same age group as out-patients with suxamethonium modified E.C.T. Four male in-patients also have had out-patient treatment.

Complications. In three patients treatment was discontinued, one case for prolonged apnoea, and two cases for cyanosis and irregularity of the heart. Vomiting occasionally occurs in out-patients and is probably due to lack of abstention from meals prior to treatment.

There have been no deaths in these patients or known fractures. No patients have complained of the severe muscular pains described by Churchill-Davidson (1954). These may be due to the surgeon's preference for a rigid metal bed rather than the comfy beds used by psychiatrists for their "operations". Patients suffering from pneumonia, dehydration, angina and past strokes have been treated without incident (Tewfik, 1953). One patient was aged 90 and made a good recovery.

Sedation. Paraldehyde and chloral are used in preference to the barbiturates, as they do not tend to excite the old people. It is a pity that chloral is so often rendered poisonous by addition of bromide and opium. It is a very satisfactory drug used alone.

About 15 per cent. of patients require night sedation and 5 per cent. day sedation.

Ambulation. This is the first principle of all geriatric cases. There are no bedridden patients here and only ten chair ridden. A chair has many advantages over a bed. It is more comfortable, appetite improves, and patients can feed themselves more easily. Bed sores and urine rashes do not occur and pulmonary congestion is relieved. Patients can partake in the social atmosphere of the ward instead of watching the ceiling. Asher (1947) has vigorously stated these views. The bedridden state is a malignant iatrogenic disease, and is quite unnecessary.

Brocklehurst (1951) in 100 bedridden incontinent cases reports no lesion on back 45 cases, urine rash alone 12 cases, bed sores alone—small—29 cases. Bed sores extensive 4 cases. Urine rash and bed sores 10 cases. Here there are no back lesions at the time of writing.

Incontinence. The first treatment is ambulation which cures or relieves the majority of cases. Nurses must respond immediately to patients' calls, and the act should be made as agreeable as possible for patient and nurse. Bed pans are the main offenders, and need only be used in exceptional cases (fractured femurs for the first week). Urinals should be placed on the locker top each night for all patients who may require them. It is a pity that female urinals are so unpopular—perhaps they are not properly designed. One old lady would steal a jam jar to take to bed to avoid getting out at night. Waterproof knickers are useful for patients with faecal soiling from rectal lesions, but tend to cause rashes in cases of urinary incontinence. Probably if a large enough cellulose napkin was available waterproof knickers would find a place.

Simplic condom drainage (Chapel, 1951) for male urinary incontinence has not been successful in the three cases in my experience. The quiet co-operative non-ambulant incontinent male patient is not found here.

The suggestion of seating the female patient on a rubber ring over a receptacle (Amulree, 1951) sounds very practical.

Weekly enemas considerably reduce faecal incontinence.

Obesity. This is a frequent complication in the female patients, and seriously interferes with attempts at ambulation. Treatment with a 1,200 calorie diet is used here. A table is placed far from the serving hatch, and all diet patients are seated together.

Fractured Femurs. Full ambulation programmes have been practised on the female side since 1950, and male since 1953.

Number of fractured femurs in patients over 65 years excluding E.C.T. fractures:

	Male	Female	Total
1949	2	1	3
1950	–	1	1
1951	1	4	5
1952	2	5	7
1953	2	3	5
Total	7	14	21

There have been no marked increases in fractured femurs. Probably as many patients break their limbs climbing over cot sides as they do in walking.

Summary

1. A method is given for the appraisal of the mental state of elderly residents in a mental hospital.
2. A review is given of the present state of patients in diagnostic groupings, and relevant comparisons made between males and females.
3. Statistics for admission and death rates are given and compared with those of other authors.
4. Statistics of physical health are given and compared with reports from the general population and chronic sick hospitals.
5. The medical, nursing and social needs for the maintenance of a therapeutic community are given.

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CLINICAL APPLICATIONS OF EEG IN PSYCHIATRY*

By

DENIS HILL, M.B., F.R.C.P., D.P.M.

Senior Lecturer

Department of Clinical Neurophysiology, Institute of Psychiatry, London

THE speakers for this morning's discussion were asked to be practical, to limit themselves to giving an account of the essential uses of the EEG technique for clinical psychiatry, and to avoid, as far as possible, the theoretical and speculative aspects of the subject. No doubt the time has come for an attempt at re-appraisal. In the last 10 years EEG departments have been developed in most of the larger mental hospitals and nearly every psychiatric centre or group, be it mental hospital, out-patient department or child guidance clinic has access to an EEG department and refers patients for examination in increasing numbers.

There are certain important contrasts to be drawn between the situation obtaining now and that evident at the end of the war. At that time, between 1945 and 1950, there had been amassed from clinical EEG departments, mainly in this country and in North America, a very considerable amount of data related to the EEG findings in the common psychiatric disorders. Thus it was generally held that from 40 to 50 per cent. of all acutely ill mental patients showed abnormalities of minor or major degree in their EEGs. The incidence of such abnormalities fell off as the average age of any group of patients increased, and was less in the chronic sick than the acutely ill. It was found that the EEG was of value in assisting in the differential diagnosis of the organic cerebral disorder from the functional psychoses and fairly precise indicators of the correlations between the different organic disorders and EEG patterns could be given. The location of tumours and abscesses was reasonably accurate and the varying EEG patterns which were related to the different sites in the brain of the lesions were recognized. The limitations of the technique for neurological diagnosis became apparent. In the functional psychoses and neuroses the EEG findings were less exciting. In about a quarter of the cases with acute schizophrenic illness, particularly those with catatonic symptoms, the EEG was abnormal at some stage of illness, but in the manic-depressive psychoses little abnormality was found. In child patients with behaviour disorders the EEG was found to be often abnormal, up to 80 per cent. in the findings of some workers and a surprising similarity to the records of epileptics was observed. Among adult patients exhibiting psychopathic personality the EEG was again often abnormal, but rarely showed patterns resembling epilepsy and the decline of abnormality, as age advanced, in both psychopaths and children, led to the idea of maturation defect in the upper reaches of the nervous system in these cases. In patients with psychoneurotic disorders, the incidence of EEG abnormality was found to be slightly above expectation, but particularly among obsessionals.

All these observations, and the literature relating to them were by 1949 quite considerable and were empirical in nature. They could not at that time be related to any physiological knowledge about how the brain works. They were conceived as due to changes in cortical excitability and organization, and

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experience from cases in which lesions in deep structures were evident, showed that disturbed function in these structures was liable to change the patterns of cortical function very considerably. The much larger experience, now gained all over the world since the war, might have led to a progressive simplification of the data and our understanding of it, so that psychiatric diagnosis and prognosis even in the functional psychoses might have been advanced by electroencephalography. To use an analogy—sufficient experience of the electrocardiogram led to the recognition of the forms of heart block, irregular rhythm, coronary occlusion and the like, and every student, with no knowledge either of electrophysiology or of cardiac pathology can make diagnoses by looking at the ECG tracing, once he has learnt to differentiate one pattern from another. A similar simplification might have been expected in clinical electroencephalography if the functional psychoses were unitary nosological entities, dependent upon pathological processes in the brain, that is, if psychiatric disorders could be included in the classical anatomico-pathological concept of disease. In fact quite the contrary has occurred. With wider experience the empirical approach to EEG data has produced, not increasing simplification, but increasing complexity and even certain strong points of clinical application have had to be abandoned. Before illustrating my point with a few examples I must mention the exceptions. Firstly the empirical approach has paid dividends at the two ends of life, in child patients and in the aged. Secondly the empirical approach has made advances in the last 5 years in neurological diagnosis, that is, in the recognition of diseased or non-functioning areas of the nervous system. I will return to this later.

Let me turn then to some of the failures of the empirical diagnostic approach. The outstanding example is seen in the epilepsies. At the end of the war it was widely held that the classical forms of the epileptic seizure, grand mal, petit mal and the psychomotor seizure, were to be related to four recognizable patterns of electrical discharge in the EEG. Soon it was observed that no hard correlation existed between one pattern of discharge in the EEG and the forms of seizure from which the patient suffered. For example the 3 c/sec. alternating spike and wave discharge is not necessarily associated with clinical petit mal. Major seizures often occur in these patients. The EEG terms, "grand mal phenomenon" and "petit mal phenomenon", therefore had to be abandoned. A study of the EEG patterns in epileptics led to a recognition of the various forms of paroxysmal discharge and it was believed that all patients who exhibited these in their EEG suffered from, or were liable to suffer from, clinical epilepsy. Interest then shifted away from the forms of epileptic discharge in the brain to endeavours to recognize the sites of origin of such discharges. But as soon as activating techniques were used to elicit these discharges in patients whose resting EEGs did not exhibit them, it was realized that they occurred in many patients and even in normal subjects who had never suffered clinical epilepsy. The relationship between the EEG patterns regarded as epileptic and the clinical phenomena known by the term, epilepsy, became progressively looser. To be more precise, bilateral paroxysmal discharges of grouped spike and waves occur spontaneously in the EEG records of some psychiatric patients and a few normal people who have never suffered from clinical epilepsy and when activating techniques, such as intermittent photic stimulation are used the incidence increases greatly. As a practical diagnostic test for clinical epilepsy, a positive response to photic stimulation is of little value in the sense that upon this evidence alone it is not justifiable to give a patient anticonvulsants. In fact quite the contrary may be the case.

For example a small number of catatonic schizophrenics exhibit this phenomenon and the administration of anticonvulsants is not indicated. The finding is not a contraindication in itself to leucotomy, to E.C.T. or to psychotherapy. While of the greatest interest theoretically this EEG pattern in a patient not suspected on clinical grounds of clinical epilepsy is of no practical importance when we have under consideration one or other of the therapeutic agents we have at our disposal at present. In making this statement it has to be conceded that all such therapeutic agents are aimed at the relief of symptoms only—not at any known pathological process which might cause them. The recent abandonment of one further strongpoint in clinical electroencephalography may be mentioned in relation to epilepsy. The lack of diagnostic specificity for most of the forms of paroxysmal discharge appeared to leave for a time the position of the strictly 3 per second alternating spike and wave complex unchallenged. This was regarded as the form of discharge most clearly related to the phenomenon we have known as idiopathic epilepsy—the form of clinical epilepsy which is the most nearly determined by the genetic factor. Gross lesions of the brain are very rarely found in these cases and family studies have shown that in identical twins where the EEG of one twin showed this pattern there was an 88 per cent. chance that the other twin would do so also, even in the absence of clinical epilepsy in this twin. Further experience has revealed beyond all reasonable doubt that this EEG pattern can develop in cases who have suffered local cortical damage which is the initiating factor in the development of the epilepsy.

To take another example. The focal slow wave abnormality is regarded as good evidence of local cortical dysfunction and the distinction can be drawn between the irregular wave form seen in association with local structural lesions and the highly rhythmic regular wave forms in the foci which have been called "physiological" which may reflect a local epileptic discharge or a maturation defect, as in the posterior temporal areas of young people. These physiological foci however may occur at a distance from local structural lesions, which themselves do not give rise to any local EEG change. For example such physiological foci may occur in the frontal areas when the lesion is occipital on the same side or in the opposite frontal lobe. They may be transient or persist for years. As an indication of local cortical damage they are false localizing signs and at present it is not possible to say from examination of a single record whether organic cerebral disease or constitutional anomaly is present.

Yet one further example must suffice to illustrate my theme. The demonstration of the cortical hemiatrophy of childhood with its associated infantile hemiplegia is seen in the loss of normal rhythms on the atrophied cortex and in partial cases the use of barbiturate sleep will enable the electroencephalographer to indicate by the selective absence of fast rhythm which are the mainly affected areas. Moreover when epilepsy has developed, the localization of spike discharges to one or more areas indicates which areas of the brain are responsible for the seizures. The spike focus is at present the last and strongest bastion of empirical electroencephalography. Its clear location should lead to a pathological lesion in the vicinity. Yet in these hemiplegia cases contralateral and often multiple spike foci are found and after hemispherectomy these foci disappear from the normal hemisphere. A similar experience is obtained from the surgery for temporal lobe epilepsy. Where more than one spike focus is found in the EEGs and particularly when these occur on both hemispheres, something more than EEG data is necessary to define the lesion, which may still be a single one. Among the first 30 patients operated upon by Mr. Murray

Falconer (1955) for temporal lobe epilepsy were 3 patients with spike foci in both temporal lobes, who were found to have single macroscopic lesions in the resected tissue. There is increasing evidence that spike discharges initiated by a local brain lesion, in time set up other spike foci, at a distance from the lesion and these secondary foci are not themselves necessarily associated with local disease. The single EEG investigation in this type of case is not only useless but may be frankly misleading, since the primary focus may not be active at the time of examination, while secondary and insignificant foci only are seen.

It seems therefore that the empirical approach to electroencephalography has resulted in an increasing complexity of data concerned with even the simplest diagnostic questions, and that the more we know the less able are we to give direct answers to clinical questions. This empirical approach to our subject is itself relatively sterile since by it we have no way of increasing our understanding of the physiological processes underlying the phenomena. The direct contributions made by clinical electroencephalography to neurophysiology are very modest and although observations and empirical data about this or that clinical condition continue to be amassed, the situation has changed very little in the last 10 years. Yet the situation for the theoretical basis of the subject has changed radically in this period, since clinical observations have stimulated research.

During the war very little neurophysiological research was carried on. The exceptional development of this subject in the last 10 years has provided us with a completely new picture of brain functions. Most of this experimental work has been done on animals. As a result, knowledge of thalamo-cortical relations, of the influence of hypothalamic and midbrain structures on the cortex is better understood. Systems of activity can be differentiated within the brain and changes in the cortical EEG can be seen in the experimental animal which resemble very closely the changes observed for years in the EEGs of our patients. These have been related to stimulation effects and lesions placed in different parts of the brain and neuraxis of animals. Central in position in this new knowledge has been the recognition of the extensive arousal system within the brain, which lies in the reticular structures of the midbrain and extends upwards to include the posterior hypothalamus, exerting its effect on cortical function through non-specific thalamic nuclei, the intralaminar structures. Stimulation of different parts of this system, or the placing of lesions within it, result in change of cortical EEG pattern in the experimental animal which resemble many of the abnormal EEG phenomena of man. But similar effects can be obtained from widely separated lesions or stimulation points within the system and indeed from other subcortical structures, such as the deep temporal lobe grey matter, not originally included in it. Similar effects on the EEG of the cortex result from different subcortical activities. The EEG therefore is but a narrow window through which we can see only the end results of extremely varied and complex activities which occur beneath the surface of the cortex. Our dissatisfaction with the phenomena is increased by the recent work of Jasper (1953) and his colleagues in Montreal which has shown that electrical activity on the surface of the cortex bears no relation to that which can occur a millimetre below it. Using microelectrodes in the cortex he has observed intense electrical activity beneath the surface when the latter showed no such activity. Moreover during operations on the temporal lobes in man, my colleagues Mr. Falconer and Dr. Pampiglione (1955) have observed seizure discharges in the hippocampus lasting many seconds when no such activity

could be recorded from the neighbouring structures or from the overlying cortex. Similar experience was obtained by Dr. Denis Williams (1953) recording from the thalamus of catatonic patients, and by Wycis, Lee and Spiegel (1949) in the United States. Spike discharges can be recorded in deep structures in these patients when the EEG of the cortex is normal.

The position today therefore contrasts with that 10 years ago. Then there was considerable data of an empirical nature but no physiological understanding to allow interpretation. Now the empirical data has increased sufficiently to allow us to know that there is little diagnostic specificity in the EEG, while on the other hand physiological understanding has increased greatly but we are still not in a position to relate with any certainty the phenomena of the EEG with what we may believe may be going on in the brain. Compared with the wealth of physiological knowledge about what is going on in the head, the EEG data seems very crude and superficial. Indeed there is still uncertainty how the EEG data should be used. Perhaps despairing of the possibility of relating such data to physiological events, there has been a tendency to cleavage in our conceptual approaches. On the one hand there are those who have tried to treat the data according to the methodology of physics, comparing the brain to a computing machine, the emphasis then being on how the mechanism deals with the influx of signals reaching it and how the brain waves might reflect the activities of such a mechanism. Brilliant analogies have been evoked in the service of such ideas but they have not yet been fruitful for clinical medicine. On the other hand EEG phenomena have been treated as visual evidence of the cortical phenomena of excitation, inhibition, facilitation and extinction, concepts originating from Pavlov and currently favoured by the French school. Yet again those favouring a dynamic or teleological approach to brain functions have searched for evidence of purpose, or at least of homeostatic regulation, in the mutual interaction of cortex and subcortical structures which the EEG demonstrates. These different systems of thought are not necessarily disparate or mutually exclusive but at present there is no common meeting ground. In practice those who would wish to relate the phenomena of the human EEG to the new neurophysiology suffer from the limitations of their technique, particularly by their inability to record at the same time from within the brain as well as from its surface.

Having referred to the changed situation of this subject and to some of the difficulties which have appeared, I must now turn to the uses of the electroencephalogram as a diagnostic technique in psychiatry. While with the exception of the rapidly developing space occupying lesion, such as a tumour or abscess, there is little or no diagnostic specificity, there can be no doubt that advances have been made in the recognition of the organic cerebral process whether it be local or diffuse, epileptic or non-epileptic. These advances have been made largely as the result of the development of activating techniques, that is, of the application of stimuli, pharmacological, physiological or psychological, which cause known alterations in the EEG of the normal. Among these activating techniques are voluntary overbreathing, induced hypoglycaemia, natural sleep or narcosis induced by a barbiturate or other drug, intravenous metrazol, intermittent high intensity photic stimuli, intermittent auditory stimuli and emotional stimuli of one kind or another. Thus psychotherapeutic exploration and more recently the showing of films of an emotionally disturbing type have been used. It is useful to consider the effects of these activating agents in so far as they demonstrate either (*a*) abnormalities of the cerebral cortex itself or (*b*) abnormalities of function in subcortical structures.

Chronic lesions of the cortex, lateralized to one side or confined to one area of the cortex may result in a selective reduction of the normal rhythm in the area, but in the frontal areas no alpha rhythm may be apparent. In these cases barbiturate-induced fast rhythm fails to appear in the damaged areas and sleep spindles and the other arousal phenomena of sleep are reduced or absent on the side. If the lesion is epileptogenic natural sleep or barbiturate narcosis is likely to initiate discharges in the area. Metrazol given in graduated doses according to a technique standardized for weight is also effective in this respect, and may demonstrate the cortical epileptogenic focus at levels of blood metrazol below that at which the subcortical system is activated and a major seizure develops. But the technique is uncertain. It is only justifiable to attempt activation of an epileptic focus by metrazol in a patient whose seizure is clearly of cortical onset from clinical observation. Voluntary overbreathing occasionally activates a cortical epileptogenic focus but is particularly useful for initiating subcortical epileptic activity. Voluntary overbreathing may also demonstrate asymmetry of slow wave activity, particularly in young subjects, and this relates to lateralized brain damage. Overbreathing, photic stimulation and emotional stimulation induce subcortical discharges.

The changes in the EEG which indicate lateralized or local cortical dysfunction can with confidence be related to pathological processes affecting the areas of cortex in which the changes are seen. Electrocorticography and the appearances of exposed cortex at operation have now sufficiently confirmed this. Local spike foci induced by these methods must however be treated with reserve, since as I have said, such discharges may be set up by lesions at a distance, either in other cortical areas or in subcortical structures. When spike discharges are found in areas which are shown to be abnormal on other evidence, for example loss of normal rhythm or barbiturate induced fast rhythm, confidence in the finding can be expressed. An example of this is seen in the spike foci of temporal lobe epilepsy, very often located by a sphenoidal electrode beneath the temporal fossa. The association of such foci with disease in the uncus, amygdaloid nucleus and hippocampus is a close one. On the other hand spike foci on the lateral surface of the temporal lobe are found in association with an apparently normal cortex from which they are recorded. Only when there is a loss of normal rhythms or of induced fast rhythms in the area can gross disease be anticipated.

Knowledge of the clinical associations of subcortical bilateral discharges is less. These are very varied in form and type. They include all the bilaterally synchronous paroxysmal discharges of slow waves, spikes, and spike and waves in different combinations. They occur, of course, most commonly in epileptics but are seen from time to time in patients suffering from almost every clinical syndrome, both diffuse organic cerebral disease and functional psychoses, as well as in metabolic disorders. When subcortical projected activity is very prominent it is very probable that there will be interference with the psychological functioning of the individual. This varies from the absence of consciousness of the petit mal patient during long sequences of spike and wave discharges, to the dulling of the epileptics with very frequent bursts of 3–6 c/sec. high voltage bilateral activity. All such activity reflects a disturbance in thalamocortical relationships and in itself does not indicate which of an immense number of causes has brought it about. Abnormalities in this system are perhaps the commonest and certainly the most striking findings in the EEGs of psychiatric patients. The great variety of clinical associations perhaps deserve further mention. These phenomena are observed in somnolence and natural sleep,

in arousal from sleep, in childhood, during overbreathing in young people, in hypoglycaemia, as a post-E.C.T. and post-insulin coma effect, in many metabolic disorders, after head injury, in tumours or lesions affecting the structures around the third ventricle, in epileptics, in acute encephalitis, in some young acute schizophrenics and in some cases of diffuse degenerative disorders of rapid development. The only symptomatic association is with the level of conscious awareness. It will be observed that these EEG patterns, admittedly themselves heterogeneous, ignore the boundaries of clinical diagnosis and reflect a central state of cerebral organization. The significance of an EEG in which abnormal subcortical type activity is seen can then only be suggested if the finding is related to all that is known about the patient's condition. The EEG cannot be interpreted empirically as an ECG is interpreted. The interpretation of EEG data must therefore always remain the responsibility of a clinician in possession of the clinical data related to the patient, and able to make judgment upon it.

How then should the EEG be used in psychiatry? There is first the diagnosis of the doubtful organic lesion or the suspected disturbance in cerebral functioning from metabolic disorder. The single EEG is rarely conclusive and particularly when metabolic dysfunction, or a toxic state is suspected, serial spaced EEGs to observe changes which can be related to the patient's mental state will alone provide evidence of the significant association. The differential diagnosis between vascular accident and neoplasm cannot be made by the EEG during the first few days after a cerebral catastrophe, but serial EEGs taken over 3–4 weeks will show a progressive improvement in the vascular case, and no such improvement in the neoplastic case. In every case a clear statement of the diagnostic problem should enable the clinician to plan the EEG investigations, to decide upon the use of suitable activating agents, the number of investigations required and their appropriate spacing in time. Next the EEG can be used to study recovery from trauma, vascular accident, inflammatory lesion or metabolic disorder. So long as progressive change towards improvement is seen in these cases, there is likely to be further clinical improvement. If the EEG has returned to normal but the patient's symptoms persist the prognosis becomes doubtful. An example in a metabolic disorder is the work of Walton (1954) and his colleagues at Newcastle who showed that 60 per cent. of patients with pernicious anaemia had abnormal EEGs but that after treatment 80 per cent. of them had normal records.

Lastly there is the difficult question of what symptoms in the patient's history lead the clinician to suspect that epileptic activity, perhaps related to a small lesion giving rise to no neurological signs, is playing a part in the patient's illness. These cases are perhaps commoner than was suspected. In the majority the epileptic focus is found to be either in a temporal lobe, in the temperoparietal cortex, or on the medial surface of the hemisphere. These patients are often called hysterics, schizophrenics, or psychopathic personalities. Indeed the personality may be very abnormal and the disorder life-long or of many years' duration. The physician's suspicions are aroused because in addition to symptoms of mood disorder, anxiety, irritability, frank psychotic behaviour and thought content, conversion symptoms, phobias, etc., there are in addition short episodes, lasting seconds or minutes, of altered experience of the self or of the environment. The relation to the psychogenic anxiety attack may be very close. Both may be initiated by a psychogenic stimulus. Both may contain the experience of visceral sensation and activity, abdominal or epigastric sensation, pallor or flushing, tachycardia and fear. Both, no doubt, reflect the

activation of the visceral brain. The epileptic patient may not for years exhibit a frank convulsive seizure, but the patient's account of his attack, or the accounts given by observers may make the diagnosis clearer. In the psychogenic anxiety attack the symptoms are a manifestation only of arousal for fight or flight and have nothing more added. In the epileptic anxiety attack, sooner or later the discharge spreads and other elements are added which do not serve defensive purposes. These additional elements or symptoms are meaningless and are for example—paraesthesiae localized to the side of the face or a limb, lateralized tinnitus, or auditory hallucination, the awareness of a partially recollected memory, or a memory out of reach, a very brief deja vu or familiarity feeling. When taste or smell hallucinations are added the matter is in no doubt. Genital sensations, too, should always give rise to doubt. Both the anxiety attack itself and the superadded visceral sensations and hallucinations, as well as the imposed mental content, as compared with the psychogenic anxiety attack are very brief. Momentary deja vu, for example, is often an epileptic phenomenon, whereas the experience lasting minutes or hours very rarely is so.

For the close observer of the patient's attack, in addition to the usual manifestations of anxiety, there may be a brief period when the patient is inaccessible. Repetitive lip movements, sucking or chewing, will of course make the epileptic diagnosis very probable indeed.

In about half these cases the single EEG carried out without activation is of little value. If the diagnosis is suspected a normal EEG should lead to further study under a barbiturate induced sleep—I.V. pentothal being the simplest method. Sphenoidal needle electrodes, inserted to lie beneath the temporal fossa of the skull will enable the focus to be identified in many patients whose EEGs recorded from the scalp remain normal.

In conclusion I should like to express my belief that the routine use of electroencephalography as a single test technique, in the way that skiagrams or ECGs are used in medicine is a procedure which has little future and will fall into disuse. Rather each EEG investigation will be either a planned experiment, the conditions of the experiment being arranged to answer a specific and perhaps limited question about the cerebral functioning of the patient, or serial EEGs will be planned to test recovery from an abnormal state or to examine the effects of treatment.

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RESEARCH PROSPECTS IN THE PSYCHOLOGY OF AGEING

By

DENNIS B. BROMLEY, B.A.

Lecturer in Psychology
University of Liverpool, England

MARQUIS (1948) has suggested that psychological research can be carried on at three fairly distinct levels: isolated experiments on particular topics, programmes of work on general topics, and long-term investigations of whole areas. This report is intended as a contribution to the third level, i.e. the level of *policy design*, and makes recommendations about the general nature and scope of psychological research on maturity and old age. The advantages of a generally accepted but informal research policy are clear: basic problems are located and adequate methods are developed for tackling them, theoretical systems become strongly linked with practical issues to the benefit of both, knowledge is more readily communicated because research workers have a common frame of reference, research findings become progressively more comprehensive, detailed, accurate and meaningful, and so on. Possible disadvantages are that originality may be curtailed and work may be duplicated, but it is doubtful whether the former is a real danger or the latter a real disadvantage. This report is not intended to specify particular research projects or programmes—this could be done only after discussion between members of research teams, their sponsors and advisers—the final choice of project depends very much on the interests and abilities of the team members and on the human ecology of the area in which they are working.

The years following adolescence are essentially years of change and readjustment, generally gradual and superficial but sometimes rapid and radical, and always cumulative. These changes are extremely complex, varied and interdependent, and they manifest themselves in all aspects of living: our bodies lose their vigour and adaptability, and we turn from violent and risky exercise to more leisurely and comfortable pastimes; our intellects lose their speed, power and originality, and we become more and more dependent upon habit and experience; our senses lose their acuity, and stimuli need to become increasingly strong before they evoke a response; our personalities lose their plasticity, and we find difficulty in learning and coping with change; the establishment of a place in society brings with it increased opportunity for leisure-time pursuits and the company of other people, yet we often fail to take advantage of these chances to better our personal conditions and enrich our inner lives; the nervous-system and the body's complex physiological structures decay—they are more prone to disease and breakdown—and this has undesirable effects on adjustment and productivity. Later maturity and old age promise us a melancholy future for we can do little at the moment to make our later years compare at all favourably with the vigour and originality of youth or the achievement of early maturity. *The specific task of psychology within the general field of gerontology is to point the way toward reduced stress and greater achievement during the mature and declining years.* This task has two aspects—that of preventing or reducing all kinds of psychological and social

deficit after maturity by promoting those influences early in life which make for all-round adjustment and achievement during adulthood, and that of alleviating deficit by encouraging those here-and-now influences in adult life which make for happiness and productivity.

Until recently, the psychological study of ageing was a neglected subject: the known facts are few, of doubtful validity, contradictory and poorly co-ordinated. Our thinking about ageing is distorted by false assumptions, unwarranted generalizations and subtle prejudices. Even in those fields which have been most fully explored, e.g. intelligence and sensori-motor skills, the findings are meagre compared with what we would like to know, and seventy years of *ad hoc* research since Galton has barely scratched the surface. As a general area of research the psychological study of maturity and ageing is wide open and promises a rich harvest. However, like most new ground, it needs to be cleared of obstructions and of these there is no shortage: we shall be dealing with people, and the ageing and aged are not the easiest people to deal with (although they are by no means the most difficult!); we must make provision for long-term follow-up studies otherwise we shall be using subjects whose past history will have to be reconstructed and therefore liable to error; often we shall find that only volunteer subjects are available, and volunteers are not representative of the population from which they are drawn, e.g. a volunteer group recently investigated by this author had an average Wechsler-Bellevue I.Q. of 120; hence the tasks of sampling, matching, and generalization of results will be difficult, although recent advances in non-parametric statistics (Savage, 1953) and rank-correlations (Kendall, 1948) have enabled us to conduct numerous experiments with small samples and have freed us from doubtful assumptions about underlying distributions. The tests and techniques that we use with children and young people are unsuitable for adults, and we have few norms for change and decline after maturity; this means that we have the task of constructing new techniques or adapting old ones, of standardizing them and establishing norms. Older people need more time, they get tired and upset easily, so that the experimenter must be patient, observant, and skilled in handling them; he will find that many of them have commitments, and that he will have to fit in with their available times and take his laboratory to them rather than *vice versa*. Group testing methods are often inadvisable, and the investigator will need time, money and assistance in handling individuals and small groups. We cannot yet turn to comparative studies for help, since such studies are virtually non-existent.

The obstructions mentioned are by no means irremovable, but they force the would-be experimenter to think hard about three fundamental topics: (*i*) Problems, (*ii*) Methods, and (*iii*) Theories.

(*i*) Problems

(*a*) The largest and most important single area in the psychology of ageing is that of *personality*, for personality is the proper focus of most psychological research and it is within the individual person that such processes as thinking, perceiving, social behaviour, skill, motivation and feeling have their origins and basis, and they can be adequately understood only as aspects of a whole living person. The crucial problem is to find out what age changes occur in the nature and organization of traits and in the dynamics of basic processes. We also want to understand the nature of maturity and discover how to exploit its potentials, e.g. maintain its insight, objectivity, drive and originality; cultivate its humour, emotional control and expression; deepen its empathy, appreciation,

philosophy and sense of values; and aid its fight for achievement and security by providing a stimulating environment and encouraging a suitable climate of opinion. In order to do this, we shall have to compile and keep up-to-date norms of adult behaviour and experience every bit as detailed as our present norms of development; we must learn how to keep track of changes in interests, activities, occupational adjustment, reactions to frustration, attitudes and preferences; we shall have to account for the tremendous individual differences between older people, their personal variability and their particular deviations from the ideal. But our inquiries should not be limited to strictly psychological topics, for we need information on the concomitants of personality change, e.g. the effects of heredity and biological conditions, socio-economic class, roles and statuses; the environment changes as well as the person, and if we can discover causal relationships between personality variables and environmental factors, then we are on the way to understanding and controlling age changes in human behaviour and experience. If the ageing personality has its defects and inconveniences, then we should search for its compensations and rewards. The amount of work done on personality changes in later maturity and old age is not inconsiderable, but it is heterogeneous and adds up to little more than a collection of preliminary inquiries using provisional tools and makeshift hypotheses. Psychological research in gerontology is likely to remain at this stage unless there is a policy to which people can conform and through which they can co-ordinate their ideas and plans, and interpret their findings.

(*b*) The next most important field concerns the *physical basis of adult behaviour and experience*. For the most part, of course, the psychologist can rely upon the geriatrician to provide him with the answers, but there are certain problems which are of special significance to him and which are amenable to his analysis, e.g. susceptibility to fatigue, stress and anxiety are important factors in occupational adjustment; respiration, circulation, personal tempo, steadiness and energy, etc. have important psychosomatic implications; the analysis of physique-temperament changes with age may throw new light on the physical basis of moods and dispositions; studies of age-trends in sex-differences will undoubtedly be of great interest apart from their possible value in contributing to our meagre knowledge and understanding of sex-linked psychological processes; the outward and visible signs of ageing are no sure guide to the biological and psychological condition of the organism, but a recent study by Benjamin (1947) has made it easier for us to study the "biological age" of our subjects, and we are to some extent freed of the ambiguous notion of "chronological age". The neurology and pathology of ageing may be expected to throw light on the psychology of growing old, and there is ample room here for inter-disciplinary research work. In his laboratory the psychologist can put to work his polygraph, dark-vision and colour-vision apparatus, his electro-encephalogram, kymograph, conditioning unit, and perhaps even his X-ray equipment in his endeavours to explore basic psychological processes; but laboratory studies are not enough, for within the organism there are many compensatory and interlinked processes which determine its unique adjustment to its environment, and we can only fully understand them in the long run by observing and controlling their operation in real-life situations.

(*c*) Perhaps the next largest area is that of *intelligence, thinking and achievement*. The ground has been cleared already to some extent by Wechsler (1944), Cattell (1943) and Lehman (1953), etc. and we have a small choice of tools and concepts to work with; we know roughly where to carry on the work and have norms to refer to. However, we need to formulate our problems more

clearly, elaborate our concepts, and standardize and improve our tools, e.g. the notion of "fluid" and "crystallized" ability is as yet only a crude approximation to the complex nature of adult intellectual organization; we have no maps of the intellect at different age-levels; changes in the quality and level of cognitive operations undoubtedly occur, yet, except for isolated studies of animism in senescence, e.g. Dennis and Mallinger (1949) and qualitative intellectual changes, e.g. Bromley (1956) we have no systematic studies in this field. Memory and imagination play an important part in the intellectual life of all classes of people, yet our ability to enrich these talents or retard their decline is negligible. Practice and experience increase with age but the results are not always beneficial: we want to know how to help the ageing person to retain his intellectual freshness and rid himself of superfluous experience; in order to do this we must carefully investigate the problems of abstraction, generalization, creative thinking and transfer of training. We should look at ordinary educational practices more carefully and find out whether we can improve the level of adult intellectual achievement, and ponder (cf. McLeish, 1952) whether we have even begun to understand the nature of adult learning. Complex mental skills such as logical analysis, mathematical computation, aesthetic appreciation, and fluent speech and writing are the end-products of long years of learning; we want to improve their status or at least retard their decline toward irrationality, guesswork, dogmatism, platitudes and incoherence. We need to know how far a lively adult intellect depends upon original ability, early experience, frequent exercise, interest, stimulation, and a sound body; these are important basic problems and we have no entirely satisfactory answers. Many occupations demand high levels of intelligence and experience, but even doctors, research-workers, politicians, engineers and administrators grow old and find their planning, assimilation of information and decision-making impaired; so that in the long run age changes directly affect our standards of living; however, our understanding of this complex scientific and social problem must necessarily await the solution of more basic problems.

(*d*) Linked with the study of decaying intellect is the study of age changes in *perceptual, learning and response processes*. The basic work on the special senses fortunately seems to be well under way, but psychologists have barely made a start on the problems encountered by the older person in his perception of space, time, colour and movement, etc. Welford (1950) has provided us with a series of careful analyses of the older person's capacity for dealing with complex, co-ordinated learning and serial tasks, but we are a long way from listing basic occupational skills and abilities or plotting expected yearly changes in psychomotor performance. All aspects of conditioning and learning are important, e.g. in occupational training and adaptation, yet little or no attempt has been made to assess the usefulness of learning theory in studying age changes in sensori-motor performance or even to consider this new field as a potential testing ground for rival theories. It is in this field, perhaps, that comparative studies of ageing would be most fruitful. Occupational hazards and stress are important factors to consider in connection with the ageing worker; we are far from a complete understanding of age changes in accident rates, work curves, productivity and job satisfaction, etc., yet work along these lines is well advanced, e.g. King and Speakman (1953) (see also International Association of Gerontology, 1955), and Le Gros Clark (1955), and could be easily extended to age problems in production lay-out, mobility of labour and training schemes. Attitude to work is an important factor in happiness, adjustment and productivity, but interests and abilities change with age, and the occupational

demands and rewards suitable at age thirty are no longer so congenial twenty or thirty years later—this holds for all kinds of work, including the professions, and presents an interesting psycho-economic problem.

(*e*) The next most important problem in the psychological study of ageing is that of *social behaviour*. Loneliness, social tensions, marital unhappiness and prejudice are not only academic problems but also real live issues affecting the lives and adjustments of many people; they are important stresses in adulthood that might be more easily alleviated if we knew more about the conditions governing their origins and development. Old age has its additional special problems: retirement, loss of spouse and children, infirmity, and reduction in power and status, each of these often a severe blow to an already severely impaired personality. The social climates in which older people live have been usefully studied by Simmons (1945) and might be responsible for much that is depressing about old age, as they are for many of the difficulties of childhood and adolescence. In the field of social learning we can study transfer of training, leadership, perception and social thinking. At higher levels of analysis we might profitably investigate informal group processes, e.g. club activities, neighbourhood relations, and even social movements. We do not know whether old age makes us more tactful, group-cohesive and democratic or more insensitive, egocentric and authoritarian; it would be strange indeed if the cumulative effects of age on status and personality did not have far-reaching effects on the social process.

(*f*) Old age presents a number of additional *special problems* peculiar to itself, e.g. we do not know the final limits of intellectual, personal and social decline; we are uncertain of the underlying distributions of and age trends in adult psychological variables because of the selective effects of death; we have too little information about the most effective counselling and retraining methods for mature and old people even in respect of recurrent stresses like retirement, bereavement, physical and mental dilapidation, etc.; we do not know how or to what extent motivational forces change with age, and until we do we shall be unable to introduce effective incentive schemes or use effective methods of persuasion. Personality factors in thinking seem to become increasingly important as age advances: uncertainty, rigidity, lack of interest, etc. all conspire to inhibit the gradually declining intellect; hence a thorough analysis of the non-intellectual factors in cognition is a key-problem in the understanding of adult thought processes and creative achievement. The study of the psychopathology of ageing is becoming increasingly important (cf. Mayer-Gross, Slater and Roth, 1954) and presents immense problems of diagnosis, prevention and treatment, for which the psychologist will be expected to help provide solutions.

(*ii*) METHODS

(*a*) If one considers the *methodology* of psychological research on ageing, then one sees that we have as yet developed few special techniques for exploring this difficult field; we have not even adapted standard procedures and tests to the task, but have blindly hoped that they would work well on tasks for which they were never intended. We should make greater use of twin studies (Kallman and Sander, 1952); the critical-incident technique (Flanagan, 1954): animal experimentation (International Association of Gerontology, 1955); and field studies (Le Gros Clark, 1955). We need to establish norms and conditions of change and decline with age, and in order to do this we shall have to re-appraise our interviewing, questionnaire, sampling and statistical techniques. The time

is ripe too for detailed reviews of certain aspects of psychological research on old age, since the discipline is growing rapidly and timely historical and general surveys, e.g. Granick (1950a) and Granick (1950b), will help us to see our problems clearly and direct our researches more effectively. Whatever problems and methods we choose, we should always carefully consider the advantages of combined cross-sectional and longitudinal studies, e.g. Jones (1950), for combined studies can be expected to produce interesting facts that either method used alone would not produce.

(*b*) *Action research* in the psychology of ageing would not only demonstrate to the community the value of psychological work, but would also provide a stimulus for the formulation of important questions, the construction of adequate theories and the preparation of proper instruments; moreover, it would provide a thorough proving ground for all these things. We should not scorn unusual methods, e.g. mobile research units and panels of volunteer subjects are in many ways ideal techniques in the study of ageing. We should tie our research closely with both professional and non-professional bodies, e.g. we should recruit subjects from and take our experiments to universities, industries and institutions as well as to homes, clubs and adult classes; we should endeavour to recruit part-time help from older people and provide opportunities for them to hear about the objectives and benefits of psychological research work on ageing and to have their comments and criticisms met.

(*iii*) Theories

For the most part there are no ready-made theories to guide the research worker toward significant psychological problems of ageing, and he will generally have to start from scratch. He should be careful, however, not to let his work be dominated by empiricism otherwise he will amass a wealth of not very meaningful facts, e.g. it would be pointless to administer complex instruments like the Rorschach Test or the M.M.P.I. to a sample of old people just to find out what happens; such instruments should be used either to test particular hypotheses drawn from general theories or else to complete or refine the test's norms—the two tasks demand quite different procedures.

Since the psychological study of ageing is likely to absorb the energies of psychologists for many generations to come, it will be worth their while to spend a good deal of effort on the task of theory building. For example, the long years of stability and socialization typical of the adult personality and its relative freedom from the conflicts of earlier years make it unlikely that Freudian theory will help us to understand the ageing person, whereas a theory of trait-organization (Cattell, 1950) and the biosocial approach to personality (Murphy, 1947) are more promising. There are at least half-a-dozen theories or concepts of adult intelligence, each containing useful ideas but none having the comprehensiveness, logic and power of prediction that we like to associate with the term "theory"; the shaping of a unified theory of intellect is a gigantic task which will hardly be accomplished before psychologists formulate a partial but accurate theory of adult intelligence.

Relationships between heredity, physique, mental disease and temperament seem at last to be getting gradually clearer, and we should not hesitate to put our current theories to the test by repeating experiments on ageing subjects; we may find that we need to make corrections and additions to our original theories. We are finding that the changes and breakdowns of perceptual, learning and response processes in old age are providing us with additional facilities for building and testing our theories, e.g. of skill (Welford, 1950) and

brain function (International Association of Gerontology, 1955); there is such a variety of theoretical formulations in this field that we are almost certain to find that some are more useful than others and that we can set up crucial experiments to decide between rival theories.

The tendency for older people to seek out like company, the tendency for industry to group older people together, the setting up of old people's homes —all these situations give rise to problems which may be solved by the application of sociometric, group dynamic and human relations techniques; it is probable too that these theoretical approaches to human social behaviour will stand to gain in richness and rigour through having to cope with the variety of facts that their methods will reveal.

This report is intended as a contribution to the "strategy" of psychological research on ageing and has suggested that there are many advantages in having an informal but generally accepted research policy. Maturity and old age can be seen as a complex process of change and re-adjustment between the person and his environment, and the specific task of psychology seems to be to point the way toward reduced stress and greater achievement during the mature and declining years. The psychological study of ageing is a relatively new endeavour and poses the investigator with a variety of difficult questions. All things considered, the new venture has got off to a good start, since comprehensive literature surveys have been compiled (Shock, 1951); general reviews of the subject have been published (Gilbert, 1952); a Gerontological Society has been established and provides, through the *Journal of Gerontology*, up-to-date information on current literature, organizations and international activities; the A.P.A. has established a division on Maturity and Old Age, and the Annual Review of Psychology gives periodical surveys of the technical literature. Nevertheless, the impression given by developments so far is that research lacks direction and cohesion, and for this reason discussion of general policy does not seem out of place. The policy recommends that psychologists should carefully examine the *Problems, Methods and Theories* of psychological research on ageing before undertaking their projects. The problems encountered in research on ageing fall into six main groups: (*a*) personality, (*b*) the physical basis of adult behaviour and experience, (*c*) intelligence, thinking and achievement, (*d*) perceptual, learning and responses processes, (*e*) social behaviour and (*f*) special problems. The methods of research on ageing are those of general psychology, although some methods are especially suited to the task, whilst others have to be invented or adapted; it is suggested that action research has a special application in this field. There is little in the way of theory to guide the research worker, except in the case of a number of rather specialized problems; it is suggested that theoretical formulations should not be ignored, since the variety and complexity of facts on ageing are such as to demand comprehensive explanatory concepts and to make pure empirical work barely worthwhile.

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A RE-EVALUATION OF THE FUGUE

By

W. P. BERRINGTON, M.D., D.P.M.
Physician Superintendent
Downshire Hospital, Downpatrick, Northern Ireland
D. W. LIDDELL, M.B., M.R.C.P., D.P.M.
Consultant Psychiatrist
and
G. A. FOULDS, M.A., Ph.D.
Director of Psychology
Runwell Hospital, near Wickford, Essex

Introduction

The fugue has received little recognition in the literature in recent years. Stengel (1941, 1943) defines the fugue state as consisting of "transitory abnormal behaviour characterized by aimless wandering, and more or less marked alteration of consciousness, usually, but not necessarily, followed by amnesia". According to Henderson and Gillespie (1944) the patient in a true fugue suddenly leaves his previous activity and goes on a journey which has no apparent relation to what he has just been doing, and for which he has complete amnesia afterwards. William McDougall (1926) states: "Fugue is the name given to those instances in which a person suddenly disappears from his accustomed haunts and re-appears at some distant place, astonished and puzzled to find himself there, and unable to give any account of himself in the period between his disappearance and his re-appearance." In a footnote McDougall adds: "This word is sometimes used in a wider sense to include wandering of a seemingly aimless kind for which the subject (generally a psychopath) can assign no adequate reason or motive, but of which, nevertheless, he can give some description." In our cases the criteria for a fugue have been sudden onset of wandering with clouding of consciousness and a more or less complete amnesia for the event.

Over the past 3 years we have collected 37 cases, either from the hospital records or from cases personally seen by us. Interesting features have emerged which, as far as we can ascertain, have not previously been described. A control group matched for sex, age and clinical diagnosis has been studied to exclude fortuitous associations. In the 37 cases of fugue under review, 31 are men and only 6 women. This incidence in favour of males is in accordance with the findings of other workers who have dealt with mixed groups, but differs from Stengel (1941), who picked his cases mainly from the female wards of Bristol Mental Hospital.

Comparison with Stengel's Series

Age distributions are compared in Table I. The age at onset of the first fugue is compared with the figures of Stengel (1941) and Kanzer (1939). The average age of Kanzer's group cannot be given as the total individual cases were not cited. It will be seen that the majority of Kanzer's group fall in the 3rd and 4th decade, Stengel's in the 2nd and 3rd, and ours in the 4th decade.

As Stengel appears to have made the most comprehensive analysis of associated phenomena, the same features have been examined in our cases and are shown in Table II. Stengel's thesis is that the similarity of fugue states in

TABLE I

Age at Onset of First Fugue

Kanzer (1939) 71 cases		Stengel (1941) 25 cases		Present Study 37 cases	
Decade	No.	Decade	No.	Decade	No.
1st	0	1st	0	1st	1
2nd	7	2nd	12	2nd	6
3rd	25	3rd	8	3rd	5
4th	24	4th	2	4th	16
5th	11	5th	3	5th	5
6th	3	6th	0	6th	3
7th	1	7th	0	7th	1
		Average Age 22·7		Average Age 31·98	

TABLE II

Features Associated with Fugues

	Stengel (1941) (25 cases)	Present Study: Fugues (37 cases)	Present Study: Controls (37 cases)
Depressive setting	24	29	20
Attempted suicide	12	10	7
Unhappy childhood	24	17	17
Alcoholism	4	10	4
Pseudologia fantastica	8	13	5
Hysterical mechanisms	3	12	8
Precipitating factors	6	35	—
Head injury	1	16	3

different mental disorders suggests common aetiological factors. His main findings are the importance of a constitutional depressive element, the impulse to wander emerging from a state of depression and a gross disturbance of home-life in childhood.

Depressive element: This was present in 24 of Stengel's 25 cases. In 29 of our cases it was a mood of depression which precipitated and/or accompanied the fugue; in 7 cases it was anxiety and in 1 case the mood could not be ascertained. The control group contained 20 cases of depression. The association between depression and fugue states in our groups was significant at the 5 per cent. level of confidence (for n=1, χ^2=4·89).

Patients attempting suicide: 12 of Stengel's cases had attempted suicide, but none had done so during the fugue. We had 10 cases of attempted suicide, 2 of which occurred during the fugue. There were, however, 7 attempted suicides in the control group. The incidence of suicidal attempts amongst our fugue states did not differ significantly from either of the other groups.

Disturbances in family life: In only one of Stengel's cases could the family life be considered normal. Five were illegitimate, to whom one parent had always been unknown; one had lost both parents. In all, 6 patients lacked both parents either temporarily or permanently during childhood; 3 lacked the parent of the same sex and 13 the parent of the opposite sex. The figures for

our fugue states are: 20 cases with a happy home life and 17 cases with an unhappy childhood, 5 of which were separated from the parent of the same sex. Our control group figures are: 20 cases with a happy home life and 17 cases with an unhappy childhood, 7 of which were separated from the parents. An unhappy childhood was commoner in Stengel's than in either of our groups, in each case the association being significant beyond the 0·1 per cent. level of confidence (for n=1, $\chi^2=16\cdot69$). An unhappy childhood is not, therefore, an essential aetiological condition for the subsequent development of fugues.

The following additional features have been compared with those found in Stengel's cases: Relation to alcohol, occurrence of pseudologia fantastica, the presence of hysterical features apart from fugue, and the presence of precipitating factors.

Relation to alcohol: Four of Stengel's cases were alcoholic; in 10 of our cases there was evidence of frequent drunkenness, and in one the fugues took place only under the influence of alcohol. Alcoholics numbered 4 in the control group. The difference between our fugue and control groups was almost significant at the 5 per cent. level of confidence (for n=1, $\chi^2=3\cdot17$). Stengel's group did not differ significantly from either of our groups.

Pseudologia fantastica: Stengel found 8 cases. We had only one; but we did find definite evidence of a frequent tendency to lying in 13 cases and possible evidence in two. Of our 37 cases, 21 had the reputation of being truthful. There were 5 persistent liars among the controls. The association between lying and our fugue states is significant at the 5 per cent. level of confidence (for n=1, $\chi^2=4\cdot70$).

Hysterical mechanisms: Stengel found hysterical mechanisms in only 3 cases. In our series of fugue patients, hysterical features, apart from fugues, were present in 12, doubtful in 1 and not present in 24. In the control group they were present in 8 cases. There is, therefore, no significant association between fugues and the presence of other hysterical mechanisms. The difference between our fugues and Stengel's is significant at the 5 per cent. level of confidence (for n=1, $\chi^2=4\cdot17$) only if the one doubtful case of hysterical mechanisms be included. In connection with hysterical mechanisms Stengel states: "In the great majority of cases the fugue states did not appear to be reactions to recent psychic events, nor did these cases show hysterical personality." He quotes Fenichel as suggesting that "the mechanisms of compulsive wandering have much in common with symptoms of obsessive compulsive states and that the person attempts by wandering to protect himself against depression".

Precipitating factors: In only 6 of Stengel's cases were precipitating factors found, while in our cases they were present in 35, doubtful in 1 and not found in 1. This difference is significant beyond the 0·1 per cent. level of confidence (for n=1, $\chi^2=30\cdot64$). This appears to show that we are dealing with a different group of patients. Presumably the more psychotic the patient the less reactive the fugue. The compulsive element stressed in Stengel's cases is not as evident in ours, though it is undoubtedly present in several.

To sum up: we find ourselves in agreement with Stengel with regard to the association between fugue states and, on the one hand, a reputation for lying and, on the other hand, a depressive mood. In the frequency of suicidal patients and alcoholics our fugue states do not differ significantly from Stengel's; but neither do they differ from our controls. Unhappiness in childhood was significantly commoner in Stengel's group than in either of our groups; hysterical mechanisms (apart from the fugues themselves) were significantly rarer in

Stengel's group than in our fugues, who did not however differ significantly from our controls. Precipitating factors were much more frequently found among our fugues than among Stengel's.

Further findings: Perhaps the most important finding in our series is the incidence of head injury. Stengel had one case of cerebral trauma and that in an epileptic. In this series, prior to the onset of the fugue, severe head injury was experienced by 16 of our cases and in a further 3 cases there was a history of head injury the severity of which we were unable to judge. In the control group a history of head injury was elicited in only 3 cases. The difference between our groups is significant at the 0·1 per cent. level of confidence (for $n=1$, $\chi^2=11\cdot97$). In the severe head injuries consciousness was always lost and there was often a long period of post-traumatic amnesia. In some of these cases the fugue started in the same year as the head injury. Sargant and Slater (1941) mentioned that in a quarter of their cases trivial concussion or dazing seemed to have played a precipitating role in producing the fugues. They described 10 cases with head injury, 5 with and 5 without intellectual impairment. In no case of ours was there any clinical or psychological evidence of impairment. Parfitt and Carlyle-Gall (1944) made reference to head injury, but did not apparently regard it as of any importance. They state: "Four suggested a recent trivial head injury as the cause of the symptom, and several others mentioned some minor head injury received years before."

Another feature prominent in our cases was that of escaping from some intolerable situation which appeared to be the immediate precipitating factor in the production of the fugue. Fourteen of the cases were escaping from justice, 3 from domestic stress, 7 from domestic and vocational stress, 1 from a love affair, 5 from a spouse, 1 from military authority, 1 from mental hospital, 2 from work and 1 from "work by compensation". The control group revealed that only one was escaping from justice but that 12 patients, prior to the onset of their illness, suffered from stressful situations similar in magnitude to those enumerated above. It is worth noting that of the 14 escaping from justice, 7 had had severe head injuries, 2 a doubtful history of head injury and 12 were liars and/or simulators.

Simulation was a further feature in our series. It was found in 10 cases, 9 of whom were escaping from justice. This feature is not specific as it was found in 8 of the control cases. It is worth noting that the simulation practised by these patients changed continuously and ranged from transitory weakness of movement to pseudo dementia.

Clinical diagnosis: The clinical diagnosis of these cases (Table III) throws

TABLE III

Diagnostic Categories of Fugue States in the Present Study

Psychopathic State	24
Hysteria	6
Reactive Depression	4
Involutional Depression	2
Schizophrenia	1

light on some of the above mentioned features. Twenty-four of our cases were suffering from psychopathic states, 10 from a psychoneurosis and only 3 could be considered psychotic. In Stengel's cases the patients were mainly epileptic or manic depressive, with some psychopathic cases. From a diagnostic point of view our fugue states fall into a predominantly psychopathic-neurotic

grouping, while Stengel's are mainly psychotic cases. Parfitt and Carlyle-Gall (1944) noted little in common between their own fugues and those of Stengel, and stated: "Stengel has written of fugues having in mind recurrent compulsive wandering rather than amnesia."

When our patients were further investigated, it was found that at the time of examination 24 had experienced more than one fugue and the remaining 13 one only. Of the 30 cases diagnosed as hysterical psychopaths, 23, or 77 per cent., had had multiple fugues; whereas of the depressives, whether psychotic or neurotic, only 1 out of 6, or 17 per cent., had had multiple fugues. The one schizophrenic had had a single fugue.

Psychopathology

In nearly all fugues there appears to be one common factor, namely, a depressive mood. Whether the individual in fugue be psychotic, neurotic, or even psychopathic, a depression seems to start off the fugue. It may be, as has been suggested, that the fugue is an attempt to ward off the depression. Some, such as Abeles and Schilder (1935), consider it to be a symbolic suicide. One of our psychopathic patients in his fugue took a route which would have brought him to his mother's home. On the way he attempted suicide while still in the fugue.

The role that head injury plays in our series appears to be particularly significant. We are not of the opinion that the organic trauma produced the fugue directly, but rather that it produced impairment which facilitated the occurrence of a psychogenic fugue, or that the concussion and subsequent amnesia formed the basis for the suggestion of a psychogenic amnesia at a later date. We incline to the latter viewpoint.

In support of this we quote Case 22 in our series: A salesman, aged 44 years, was admitted having been found wandering. He had disappeared from his home 5 days previously and had no idea of what he had been doing. In addition, he had a total amnesia for the past 16 years, dating from the time he was concussed in a professional boxing match. This injury, which was probably a middle meningeal haemorrhage, was a delayed one. On recovering his memory with us, under pentothal, he remembered starting his fugue from a coffee stall. He next recalled the fact that after the fight 16 years previously he had visited a coffee stall with some friends. It was here that he lost consciousness and remained unconscious for several days. He said: "I seemed to be back at the coffee stall after the fight—memories of the fight—at the same time felt I had to go to Hastings—walked and walked." It would seem, therefore, that the one coffee stall recalled the other 16 years previously and suggested amnesia. The patient remarked that until that moment he had not remembered the fight. There had been retrograde amnesia for it. As in many organic amnesias, there appears to have been a portion which was psychogenic and capable of being recalled.

These findings suggest that, where hystero-psychopathic personality and head injury co-exist, there is an increased likelihood of any subsequent breakdown taking the form of a fugue.

Stengel's theory concerning the production of the fugue has already been elaborated. Apart from this, the majority of the literature concerns the fugue occurring in war neuroses. There are few expert reports of persons actually seen in a fugue state. As in this hospital, they are usually seen after they have recovered from the fugue. The patient may be his normal self when he emerges

from the fugue, aware of his identity, with full memory of his past life (apart from the fugue period), or he may be unaware of his identity and of his past life. The awareness of personal identity does not appear to operate in the state of fugue. During this time patients appear to act in a kind of dream with only a few thoughts present in consciousness, for example, to get somewhere, to do something; or they ruminate over their specific problems. Many appear to have a feeling of guilt, often justified, sometimes fancied. When their reverie is broken by questioning or by some chance association, they may react normally; but they have partial or complete amnesia for the fugue, sometimes for their whole past life.

Some workers have recognized two types of fugue state: those with awareness of loss of personal identity and those with retrograde amnesia, the latter being aware of their identity but having amnesia for the fugue. Some workers, including Parfitt and Carlyle-Gall (1944), consider that this amnesia is feigned; others that it is hysterical in that it is suggested by the questioner and reinforced by secondary gain. According to McGeoch (1939), the person in a state of fugue cannot give true information about himself; but few have been questioned at this time. Describing the fugue state, Janet (1907) writes: "Things happen as if an idea, a partial system of thoughts, emancipated itself, became independent and developed on its own account. The result is, on the one hand, that it develops far too much, and on the other hand, that consciousness appears no longer to control it." This limitation to a circumscribed set of ideas is very reminiscent of the mental state of some of our psychotic depressives.

Gill and Rapaport (1950) observed a patient in a state of fugue. In the period of fugue, which was preceded by financial trouble, the subject was obsessed by the idea that he was out to find a job. He was in touch with his surroundings but did not recognize them. Though his personal identity was forgotten, he was not concerned over this loss and appeared to be unaware of it; instead, a single striving "to get a job" regulated his behaviour. Upon recovering spontaneously he forgot everything that had happened. This case supports Janet's (1907) description, but it does more than this. The case history, according to Rapaport (1950), shows that the striving was equivalent to escaping from responsibility to his family. This striving was guilt-laden and so forbidden. He could, as it were, only carry out the single striving to get work if at the same time he forgot the family whom he had left behind. How can this striving become so powerful as to effect the dissociation? "These isolated memories of the fugue which were recovered," says Rapaport (1950), "were organized around a set of unacceptable strivings. It is possible that when sufficiently strong and numerous strivings can find expression through one striving, and when the nature of these strivings is such that the relevant memories must be repressed, then the full body of memories containing the meaning of the various strivings (expressed now by a single striving) is forgotten. The striving which condenses the various strivings becomes paramount and rules consciousness, and this is the motif around which the fugue is built."

It will be noticed that Rapaport is not so much talking about forgetting as painting a picture of memories organized around strivings, emerging or receding with the predominance or repression of these strivings. It appears to be a positive, not a negative, process.

Rapaport finds that emotional factors lend persistence to certain ideas, impelling them steadily into consciousness. These emotional factors appear to be the basis of the blotting out of memories of certain periods of life which were organized around specific strivings, when later these strivings were super-

seded by others or became unacceptable. He states that he is unaware of the exact nature of these emotional factors. It is suggested by the present authors that a depressive affect may be the most important. There is something wholly consuming about depression. The imagined guilt of the agitated depressive occupies his thoughts to the exclusion of all others. We have seen that fugues appear to be the result of intense conflict. The person in a fugue is always in a situation in which he can neither escape from an anticipated danger nor has he the power to fight against it; he cannot fight any longer because he feels he is beaten; he cannot escape because his conscience forbids it. He becomes depressed, his ideas become centered around his problem and his depression lends force to this pre-occupation which excludes other thoughts. He may depart one morning to work but he is not really thinking of where he is going; his movements are almost automatic; he attends neither to himself nor to those around him. It is then that dissociation occurs. His "little system of ideas" takes possession of consciousness and with this he is in a fugue state.

The model for his loss of identity is perhaps often supplied by the previous head injury with its resultant amnesia. In some cases this may be reinforced by a predisposition to alcohol which, when taken in excess, serves for another amnesic model.

Summary

1. Thirty-seven cases of fugue are presented, of which 24 had multiple and 13 single fugues.

2. Severe head injury was found in 16 cases and doubtful head injury in 3 cases, as against 3 in the controls. Ten of the patients were also alcoholic.

3. Depression was noted as a prominent feature in both fugue and control groups. When compared with the control group, a broken home life was not found to be specific.

4. Hysterical mechanisms were found to be fairly common and compulsive features rare. Clinically, most of the cases fell into a psychopathic-neurotic grouping.

5. The probable roles that head injury, depression and alcoholism play in the production of fugues have been discussed.

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ENCEPHALITIS PERIAXIALIS DIFFUSA WITH SURVIVAL FOR THIRTY-SIX YEARS

By

R. M. STEWART, M.D., F.R.C.P., D.P.M.

Consultant Psychiatrist

Prison and Borstal Services, Scottish Home Department

In 1928 Symonds (1928) recorded a case of Schilder's encephalitis, the disease being remarkable for its familial incidence and the presence of a progressive double hemiplegia. Since this date other writers have fully confirmed his observations.

Familial forms of Schilder's Encephalitis have been described by Ferraro (1928) and Van Bogaert and Nyssen (1936) while Bouman (1934) has emphasized that in children quadriplegia is the usual clinical finding.

The present report deals with the clinical and pathological findings in a girl who was the second of thirteen children in the family studied by Symonds. Clinically, the case was remarkable for the very long period of survival and pathologically, by reason of the extensive degree of spinal cord degeneration with but little evidence of sclerosis in the cerebral hemispheres.

Case Report

Family History

The father earned his living as a skinner and enjoyed good health. The mother died of pulmonary tuberculosis, aged 44 years.

There were 13 children in the family:

1. Male, died aged 2 weeks: cause not known.
2. N. P. the patient, died Schilder's encephalitis, aged 36 years.
3. Male, died aged 18 years, pulmonary tuberculosis.
4. Female, died aged 13 months, "meningitis".
5. Female, died aged 13 years, "meningitis".
6. Female, aged 30 years, alive and well.
7. Male, died aged 16 years, Schilder's encephalitis.
8. Sex not known, died aged 7 months, "meningitis".
9. Sex not known, died aged 9 months, convulsions.
10. Male, died aged 6 years, Schilder's encephalitis. Dr. Symond's case.
11. Male, died aged 9 months, "meningitis".
12. Male, aged 18 years, alive and well.
13. Female, aged 17 years, alive and well.

N.P. was born on 16 December, 1906. She talked early and walked at 10 months. The exact date of the attack of encephalitis is uncertain. The mother thought her daughter was about 18 months old while the medical officer who certified her to be mentally defective described her as "paralysed and helpless from the age of ten months". It seems certain, however, that the illness commenced before the second year. In March, 1918, on admission to the Fountain Hospital, she was described as being helpless, unable to sit or stand alone, with contractions of the hands and crippled lower limbs. Her mental state was one of imbecility. Later reports said she talked to the other patients and was remarkably observant.

On her admission to Leavesden Hospital in April, 1922 she was noted to be unable to read or to count beyond ten. Though her vision was impaired she was able to recognize simple objects. The paralysis progressed slowly and by February, 1925 she had become blind and almost helpless.

On 18 December, 1926 she was examined by Symonds when the following notes were made.

From nurses. She will converse in a childish way with them and with other patients. Takes food slowly out of a spoon, has no dysphagia. Knows where she is. Recognizes people by their voices. Can see a little. Has not changed much in last year or so, except that she has become more faulty in her habits. No epilepsy.

Examination. On hearing strange voices became agitated and distressed, crying and shrieking for Nurse Mabel, and saying "Go away". Articulation clear, voice strong. Can distinguish light from darkness. Told by nurse that the visitors were gone, she said "Go

away" when I flashed an electric torch in her face. Optic discs pale and clear cut, the appearance of primary optic atrophy. Pupils dilated and do not react to light. Divergent strabismus but no definite ocular paresis detected. No nystagmus. Right face weaker than left as she cries. Sensation not examined for want of co-operation.

Motor system: As she lies in bed the head is somewhat retracted, but this is less evident when she is sat up, and it is difficult to distinguish between resistance and true rigidity. The upper limbs are symmetrically fixed in the following position: Adduction at the shoulders. Extreme flexion at the elbows. Extreme pronation at the wrists. Extreme flexion at the wrists and metacarpophalangeal joints. Extension of inter-phalangeal joints. Adduction of thumbs. The rigidity appears to be of the clasp-knife type, but voluntary resistance and contracture make examination difficult. There is apparently no voluntary power, but handling the limbs produced flexor spasms. No wasting.

Trunk: Nothing abnormal noted.

Lower limbs: Both semiflexed at hips, and knees and ankles with toes flexed and curled downwards.

Reflexes: Tapping under limbs provoked some clonic spasms of biceps. Abdominals not elicited—but interfered with by crying. In the lower limbs tapping produces clonic spasm of calf muscles; no other reflexes obtained.

Sphincters: Wet and dirty.

General physique: Head and trunk normally developed. Pubic hair normal. Limbs small as in an infantile hemiplegia, with cyanosed extremities. Extreme pyorrhoea. Liver and spleen not felt. Kyphosis of lumbar spine. Chest not examined on account of struggling.

Reflexes. Abdominals present but diminished; plantars, double extensor response. Jaw jerk present. Biceps and triceps jerks exaggerated; supinator jerks normal. Knee and ankle jerks exaggerated. Adductor jerk present. Ankle clonus can be induced by tapping toes. No sphincter loss. No Magnus and de Kleyn neck reflexes.

Progress. In November, 1942 a small pressure sore appeared on the inner aspect of the right knee. It proved resistant to treatment and finally gave rise to a general septicaemia to which the patient succumbed three weeks later.

Autopsy Findings

Brain. Weight after formalin fixation 849 g. Microcephalus symmetrical and firmer than normal. No abnormality of membranes or vessels and no convolutional atrophy. Brain stem small, optic nerves and tracts atrophic, olives conspicuous and pyramids represented by narrow flattened bands.

Coronal sections of the cerebral hemispheres show a very striking diminution in the amount of white matter in the centrum ovale, the cortical grey matter being apparently intact. Both lateral ventricles are moderately dilated and close scrutiny reveals the presence in the white matter of a few faint grey bands. These are beneath the convolutions and in relation to the ventricular walls. They are more numerous in the frontal than in the occipital lobes.

In each hemisphere the claustrum appears attenuated. One small sharply defined cavity is present in the white matter of the right precentral convolution.

The spinal cord is small and sections of cervical and dorsal segments show widespread degeneration in the lateral and posterior columns.

Microscopic Examination

Cerebral Hemispheres. The changes present are all of a chronic character. The small disseminated patches of sclerosis, scanty in number, do not impinge on the subcortical U fibres; histologically, they are quite typical of the pathological findings in this form of encephalitis. In them there is an almost complete loss of myelin sheaths with uneven thickenings on those surviving at their periphery, a disappearance of many of the axis cylinders and a very vigorous proliferation of fibrous glia. Inside the patches the blood vessels have proliferated and show thickening of their walls. In the cortical grey matter the normal columnar arrangement of nerve cells is preserved. In the precentral areas no groups of giant Betz cells can be seen, while most of the smaller nerve cells show finely granular Nissl bodies.

In the area striata of the occipital lobes the densely crowded cells of lamina IV are less numerous than normal. Both here and in the frontal lobes astrocytes and oligodendroglia are increased in number. In certain areas the subcortical white matter shows a fine fibrillary gliosis. A few rod cells are present. In the optic nerves there is complete loss of myelin sheaths.

Pons. There is marked degeneration of the myelinated fibres of the posterior longitudinal bundles, of the cortico-spinal tracts and of the transverse fibres of the formatio reticularis. Holzer preparations show a coarse marginal gliosis, greatest on the floor of the fourth ventricle and in the pyramidal bundles; in other areas of the pons there is a very fine gliosis.

Cerebellum. A single area of sharply defined sclerosis is present in the central white matter of the right hemisphere. There are no noteworthy cellular changes. Purkinje cells are normal in number and appearance.

Medulla Oblongata. The medulla is small, the inferior olives being relatively large and the pyramids rudimentary. Occupying roughly its dorsal third there is a large sharply defined area of demyelination. It reaches almost to the floor of the fourth ventricle and involves the restiform bodies and the formatio reticularis. In it one notes the complete absence of the

normally conspicuous fibres of the fasciculus solitarius. The fibres of the medial lemniscus and of the posterior longitudinal bundle stain well, but there is a loss of some of the olivo-cerebellar fibres. Many olivary cells present a degenerate appearance but elsewhere the larger nerve cells show no loss, even in areas where sclerosis is most pronounced.

The whole of the medulla is permeated by a fibrillary gliosis which assumes a marked density in the dorsal sclerotic area, in the olives and in the two pyramids.

Spinal Cord. The cord is small and shows wide-spread degeneration in the lateral and posterior columns. The areas of demyelination are present throughout the cervical and dorsal segments of the cord. Except in the postero-external columns the myelin sheaths stain badly.

Cervical Cord. In the cervical cord a conspicuous patch of complete demyelination is present in the column of Goll. Its borders are sharply circumscribed and are separated from the margin of the cord and its central grey commissure by partially degenerated areas in which some nerve fibres survive. In each lateral column there is a symmetrically placed band of sclerosis and there is also some degeneration of the direct pyramidal tracts. In the grey matter the nerve fibres stain well. Those of the anterior nerve roots are partially degenerated while in the posterior nerve roots the myelin loss is total. Holzer preparations show a wide-spread fibrillary gliosis, for the most part fine but with coarse fibres in the grey matter and in the columns of Goll. In the sclerosed areas there are many thick walled capillaries.

The cells of the anterior horn exhibit degenerative changes of a chronic nature—loss of tigroid substance and displacement of the nucleus to the periphery. There is no increase of intracellular pigment.

Dorsal Cord. The upper dorsal cord is misshapen, the posterior columns projecting beyond the general contour with the anterior horns of unequal size, the right being abnormally narrow. In this region the process of demyelination is much more widespread. Centrally placed, there is a very large area of sclerosis which involves the greater part of the posterior columns and all the grey matter except its anterior horns. Except for a zone immediately surrounding the grey matter, the anterior and lateral columns are spared. As in the cervical cord, the blood vessels in the degenerated area show numerous thick-walled vessels.

Conspicuous in the upper dorsal segments is a zone surrounding the area of demyelination in which owing to the disappearance of both myelin sheaths and axis cylinders, the white matter presents a cribriform or vacuolated appearance. Only a few nerve cells have survived in the anterior horns. These changes become progressively less marked in the lower segments, demyelination being finally represented by an isolated area in the posterior columns. Below the twelfth dorsal segment no degeneration can be found.

Discussion

Clinically, this case affords confirmation for the view that familial cases of Schilder's encephalitis can pursue an extremely chronic course. One may, perhaps, go further and say that the history indicates that the disease is capable of arrest for in the last few years of the patient's life her symptoms underwent no change, death being due to an intercurrent infection.

From the pathological aspect the case is of interest in that the incidence of the disease seems to have been exercised as much, if not more, on the brain stem and spinal cord as on the cerebral hemispheres.

In the majority of cases previously recorded stress has been laid on the cerebral lesions, possibly because opportunity is seldom afforded for histological study of the spinal cord. No examination was made of the cord of the two siblings of this patient nor in any of the six cases described in Bouman's (1934) monograph. Flatau (1925) noted in the spinal cord small celled infiltration of vessels, principally in the neighbourhood of the pyramidal tracts. In the grey matter there was an increase in the number of glial cells. In their third case of Schilder's encephalitis, Grainger Stewart and his co-workers (1927) observed swelling of the cervical region of the spinal cord in its right half. Some cervical segments were completely involved while at a lower level the white matter bordering on the grey horns was acutely congested, the horns themselves appearing healthy. Microscopically, the myelin sheaths in the damaged areas were swollen and broken up, there being many compound granular corpuscles laden with fatty material and scattered throughout the tissue or collected round vessels.

In an example of diffuse sclerosis reported by Bielschowsky and Maas (1932) patches closely resembling those of disseminated sclerosis were found

throughout the cord and very similar appearances were reported by Wertham (1932) in two adult cases of diffuse sclerosis.

In the case under consideration the degenerative changes in the cerebrum were on the whole typical of Schilder's encephalitis, though in view of the patient's loss of vision, the comparatively slight involvement of the occipital lobes was an unexpected finding. The total blindness was doubtless due to demyelination of the optic nerves. In the cerebellum, medulla oblongata and spinal cord the areas of demyelination bore a considerable resemblance to those of disseminated sclerosis. They lacked, however, the sharply defined margins which characterize the lesions in that disease and the loss of axis cylinders was another distinguishing feature. In the cord the maximum intensity of the disease was in the mid-thoracic region where the cribriform appearance—*Lückenfelder*—of some segments was perhaps more in harmony with the findings in subacute combined degeneration than those of disseminated sclerosis.

Another noteworthy feature was the paucity of white matter in the centrum ovale. Clearly, the microscopic smallness of the brain was attributable not to the intensity of the sclerosis but to an arrest of development occurring at the end of the first year when symptoms became manifest. It may be recalled that the largest contribution to the rapid increase in the weight and size of the brain during the first years of childhood is determined principally by formation of the medullary substance which according to Donaldson (1895) in the mature brain constitutes 47 per cent. of its total weight.

In a chronic case, such as this, it cannot be expected that the pathological findings will throw any light on the predisposing or precipitating causes of Schilder's encephalitis and related conditions, nor on the vexed question of whether the demyelination is one of disintegration of a myelin defectively formed or a primary change in normal myelin which has suffered nutritional deficiency. And on the clinical side the history fails to indicate any factors in the home which were operative in causing the death from nervous disease of no less than five siblings in the first few months of life in addition to the three afflicted by Schilder's encephalitis. In particular, nothing is known of the state of nutrition in the home or of such questions as whether the children were breast or bottle fed. It is known, however, that the family were slum dwellers and the somewhat lowly occupation of the father suggests that the children may have been the victims of a dietary deficiency. In this connection it is of interest to note that Meyer and Tennent (1936) have suggested avitaminosis as a causative factor in Schilder's encephalitis.

Summary

A familial case of Schilder's encephalitis is described in which the patient survived the acute phase of the illness for thirty-six years. The microcephalic brain showed not only diffuse demyelination but also a very marked poverty of white matter. In the cerebellum, medulla oblongata, cervical and dorsal segments of the cord there were numerous circumscribed lesions bearing a superficial resemblance to those of disseminated sclerosis.

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SPATIAL DISORIENTATION IN SENILE DEMENTIA

THE PSYCHOLOGICAL MECHANISMS DISTURBED AND SOME SUGGESTED METHODS OF COMPENSATION

By

MOYRA WILLIAMS, D.Phil.

United Oxford Hospitals Geriatric Unit, Cowley Road, Oxford

Introduction

Disorientation in a new place (e.g. a hospital ward) and inability to remember a route after having been shown and having walked it several times, is a well known feature of senile dementia. These disturbances are a frequent practical cause of difficulty, since such patients are not uncommonly physically fit and active and unless allowed to wander about during some of their waking hours become irritable and unhappy. Yet their supervision and care places a great strain on those responsible for their welfare. If left to themselves they have a tendency to fall downstairs or to wander on to roads which renders them a menace both to themselves and to others. Some insight into the causes of spatial disorientation in the elderly, and ways in which it might to some extent be compensated for, would therefore be of considerable practical assistance. It may not lead to a cure of the defects, any more than a study of the reasons for getting lost in a fog will help to relieve the meteorological conditions. What it may do, however, is to discover the equivalent to senile patients of "cats' eyes" to the motorist, and help to relieve labour and prevent accidents.

Loss of spatial orientation is not specific to senile dementia. It is almost always associated with some degree of cerebral disturbance (the organic confusional state), but is most clearly depicted and has been most fully studied in association with parietal lobe lesions (Critchley, 1953; Zangwill, 1951). In the latter cases, the insight and intelligence so frequently retained by the patients enables some idea to be gained of the mechanisms in the disability. Thus it appears that right-left discrimination is grossly at fault, and much of the difficulty is due to the patient being unable to take into consideration more than one small aspect of his perceptual environment at a time.

In the organic confusional state, spatial disorientation may be due in part to similar neurological deficits and perceptual restrictions (Paterson, 1943), but other cerebral areas and psychological factors are probably involved as well. On the psychological side, loss of memory and of critical judgment complicate the picture and emotional attachments appear to play an extremely important part (Paterson and Zangwill, 1944).

In the senile and pre-senile dementias, spatial disorientation never appears to have been singled out for special study. There seems to have been a tendency to write it off as due to general failure of intellect and memory and to consider that these terms afford an adequate explanation of the condition. But before loss of intelligence and memory can be regarded as adequate explanations for the symptoms of organic dementia, they themselves must be more clearly understood. To evoke one undefined word to explain another does not really clarify the situation, and our concepts of intelligence and memory are still far from being satisfactorily crystallized. Moreover a list of the defects noted

in different neurological or psychiatric disorders seldom leads to very positive results. Of far greater value on the practical side is a survey of the abilities retained and of the behaviour typically exhibited by the patients under consideration.

A preliminary survey of the situation, carried out by the present writer on some 20 patients aged 65 to 95 who were referred to the Oxford Geriatric Unit for reasons of mental disturbance or dementia indicated some lines of investigation which appeared promising. It was noted that despite the typical loss of memory so prominent in this condition, familiarity with an environment did, as has been noted by Bonhoeffer (1901), frequently lead to improved route finding. But it was also noticed that patients tended to take cues from many different sources, and that those individuals who were maintained in a lively atmosphere where there was entertainment and mental stimulation tended on the whole to present less difficulties than those who were kept in quieter surroundings (Cosin, 1954).

In the present paper a short account is given of some experiments planned to assess more reliably the value to senile subjects of (*a*) training in route-finding, (*b*) general mental stimulation in the perceptual field, together with a list of the cues to which the patients appeared to be most responsive.

Experimental Procedure. In order to have some standardized situation in which the behaviour of the patients could be compared, it was decided to test the patients on a paper maze, but preliminary trials soon indicated that none of these tests standardized on humans to date are very suitable for use with subjects suffering from senile dementia. They are either too faintly depicted to be seen by those with failing eye-sight, too difficult to trace for those with restricted movements, or involve too complex a set of instructions to be grasped adequately by those with failing intellects. It was therefore necessary to devise a new form of test in which allowances were made for the above disabilities. A set of situations based on the "detour problem" used in animal studies (Köhler, 1925; Liddell, 1937) and illustrated in Fig. 1 was found to be the most satisfactory and to yield the most interesting results.

The only maze to be given in a standardized manner throughout the experiments was D3. Performance on this was placed in one of the following categories:

(1) Succeeded at first trial.
(2) Succeeded within three trials.
(3) Failed in three trials.

Maze A was given to each subject before he was selected for the experiments to ensure that visual acuity was well enough preserved and that co-operation would be sufficiently forthcoming for him to be suitable for inclusion. The subjects were interviewed singly. Each one was first shown A and was asked to "Point to the spot, then to the cross, then to the black line". He was then told "Now I want you to put your finger on the spot and show me how you could get from the spot to the cross, keeping your finger on the paper the whole time and not going over the black lines". According to the nature of the mistake, if one was made, the pertinent part of the instructions was repeated. After each mistake, the subject was made to start again at the original spot. If subjects were unable to solve this test for themselves, they were shown the two alternative routes. Only if they failed to find one of the routes by themselves immediately after this demonstration were they excluded from further tests.

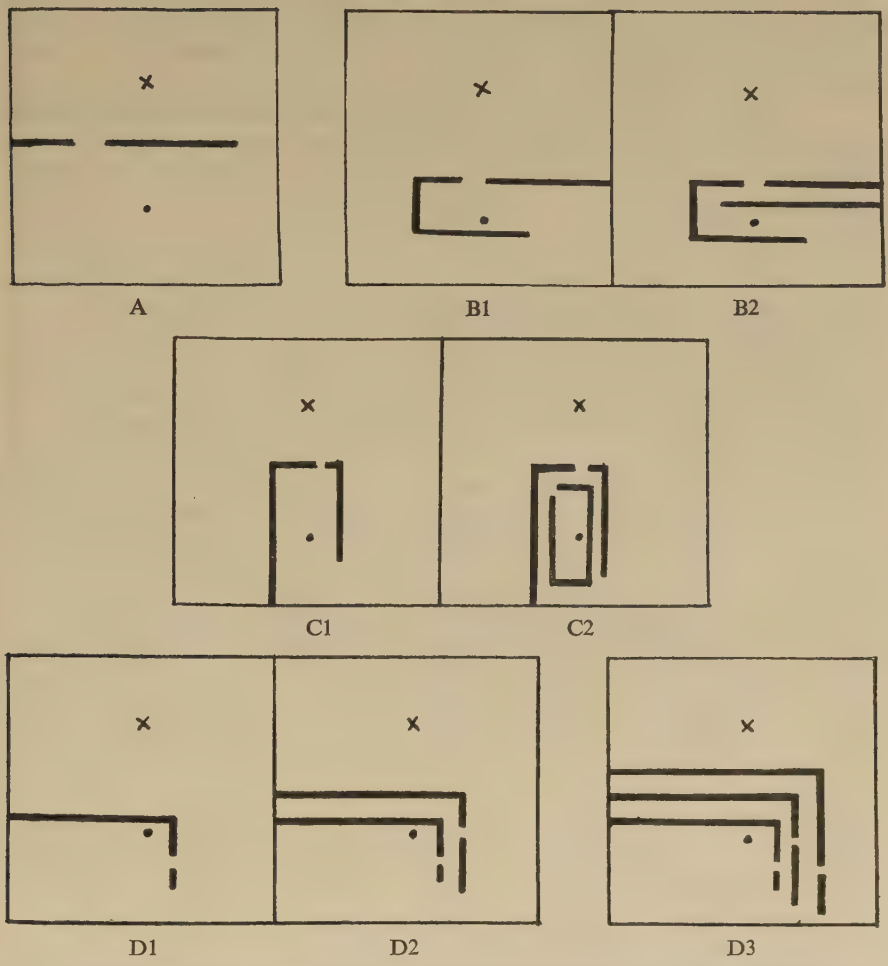

FIG. 1—Mazes used with patients suffering from senile dementia. Subjects were instructed to place a finger on the spot and trace the route to the cross keeping the finger on the paper and not going over the black line.

Immediately after A, subjects were shown another maze, with the instructions: "Now here is another problem of the same sort. Start with your finger on the spot and show me how you can get up to the cross keeping your finger on the paper but not going over the black lines." Demonstrations by the examiner of routes other than A were not given except where mentioned.

Subjects. Sixty patients from the United Oxford Hospitals' Geriatric Unit at Cowley Road Hospital took part in these experiments. Although their ages ranged from 65 to 95, the majority were in the 80 to 90 age group. The patients studied had all been hospitalized primarily for reasons of mental impairment. Although many were suffering from senile atherosclerosis and others might have had minor cerebro-vascular accidents, none of them were critically ill or showed specific defects of speech, hearing or vision. All the patients were able to carry on a simple conversation, but they were unable to look after themselves. They were fully disorientated for both time and space and out of touch with all recent world events. Their scores on a simple 20 item question-

naire of orientation and memory (The Tooting Bec Questionnaire, Doust *et al.*, 1953) ranged from 3 to 6, the average for a group of people from a similar background in a Part III institution being 8·3.

These patients were divided into 6 groups of 10, the groups being matched as far as possible for age, physical state and mental preservation. The groups were tested under different conditions as follows:

Group	*Sequence of Testing*
1	Maze A followed immediately by D3.
2	Maze A. Subjects were then shown and asked to interpret ambiguous black and white pictures, and were then tested on D3.
3	Maze A. Subjects were then given Mazes B1 and 2, C1 and 2 and finally D3.
4	Maze A. Subjects were then shown Mazes D1 and 2 with either verbal assistance or demonstration if necessary. After 24 hours they were tested on D3.
5	Maze A, and following sequence as above, except that only ½ hour elapsed between the training on D1 and 2 and the test on D3.
6	Maze A and sequence as above, but D3 given immediately after D1 and 2.

Results. The number of patients in each group who succeeded or failed on test D3 is shown in Table I, and the statistical significance of these differences

TABLE I

Showing the Distribution of Successes and Failures on Maze D3 in the Different Experimental Groups

Group	Conditions	Succeeded		Failed
		At 1st Trial	Within 3 Trials	Within 3 Trials
1	Immediately after A	1	2	7
2	After pictures	2	4	4
3	After Mazes B1 and 2, C1 and 2	3	3	4
4	24 hours after D1 and 2	4	1	5
5	½ hour after D1 and 2	6	2	2
6	Immediately after D 1 and 2 ..	7	1	2

TABLE II

Showing the Value of χ^2, for the Difference Between the Successes and Failures of the Experimental Groups

Groups	χ^2	P.
1 and 2	1·8	—
1 and 3	1·8	—
1 and 4	0·82	—
1 and 6	5·0	0·02
2 and 3	0·0	—
4 and 5	2·0	0·20
4 and 6	2·0	0·20

as calculated by the χ^2 technique is shown in Table II. It will be seen that many more subjects in groups 5 and 6 (i.e. those who received preliminary training on D1 and D2 within half an hour of the crucial test itself) succeeded in finding the route on D3 than was the case in the other groups, but the performance of group 4 indicates that similar training given 24 hours before the

crucial test has no significant effect. The performance of groups 2 and 3 suggest that mental stimulation on allied perceptual tests immediately before the crucial test improves performance, but with such small groups the differences are not large enough to be statistically significant.

From these results it seems justifiable to conclude that in subjects suffering from senile dementia, as in normal people, practice on a task allied to the one under consideration materially assists performance, but that the degree of assistance varies with (*a*) the psychological relationship, (*b*) the time elapsing between training and test.

Behaviour during Performance. Of just as much interest as the statistical results reported above, is an analysis of the behaviour shown by the subjects in the maze situation, and particularly the nature of the mistakes they made. The latter can be divided into several classes.

(1) A tendency to make directly for the goal, regardless of the instructions. The goal appeared to have such a strong attraction for them that, like some of the less intelligent animals in a detour situation, these patients were unable to detach themselves from it. Thus, if the gap in the black lines fell between the starting point and the goal (as in the B and C mazes) the subjects were usually able to find it without difficulty. It was only when the necessity arose to go away from the goal in order to find the gap that difficulty was experienced and the instruction "not to go over the black line" was seriously ignored.

In other cases, the attraction of the goal was seen in a tendency to turn towards it too quickly. A very common error was that illustrated in Fig. 2. Some subjects repeated this mistake again and again, even though realizing their error each time they arrived at "w".

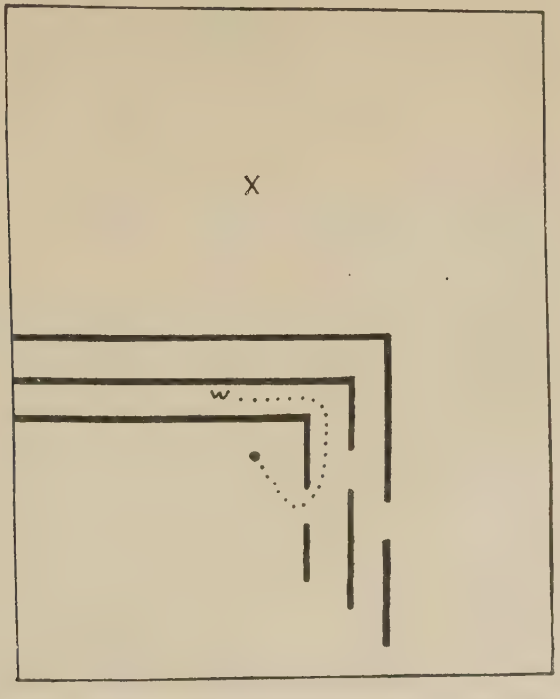

FIG. 2—Illustrating an error frequently made by subjects due to turning for the goal too soon.

(2) A tendency to follow the black lines. For many patients the black lines themselves seemed to form an irresistible attraction. As soon as his finger touched a line, the patient would begin to move up and down along it, being apparently unable to detach himself from it and make off across an open space.

In view of this finding, some subjects were tried on a maze in which the route to be followed was similar to that in D3 but was shown by a black line on white paper (Fig. 3). The subjects, however, were no more successful at finding the correct route on this than on D3 itself, although it seemed to give them greater satisfaction and was a less traumatic experience to them.

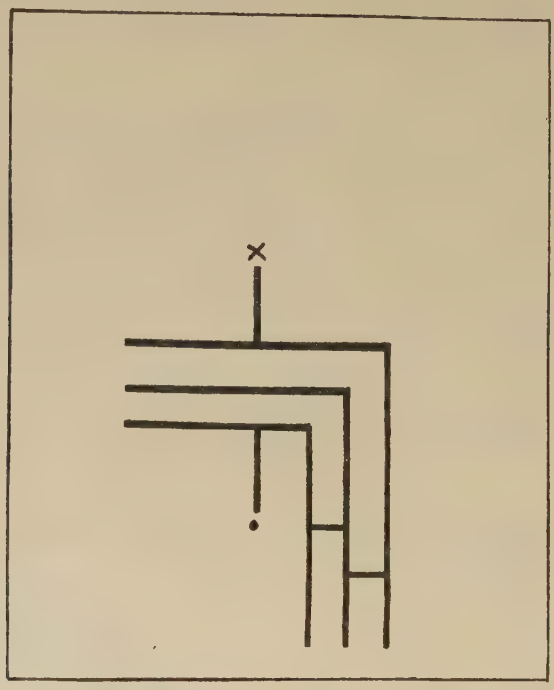

FIG. 3.—A Maze following the same principle as D3, but in which the subject had to run his finger along the black line instead of avoiding it.

(3) A tendency to make for gaps and blind alleys. If, while following down the side of the black line, the patients came to one of the gaps, they seldom passed it over. They nearly always went through the gap and explored the blind alley beyond.

(4) Forgetfulness of the goal. Many patients would start off in the right direction with apparent insight, but after a few seconds began moving their fingers through the gaps with painstaking care and then sat back as if their task was completed. Questioning revealed that they had nearly always lost track of the task set them.

(5) Inability to keep more than one command in mind at a time. This was indicated by the manner in which patients would frequently switch from one type of mistake to another, depending on the latest instructions they received. (E.g. The patient begins tracing patterns along the black lines. E.—"I want you to show me the way to the cross". Patient moves finger straight over the black lines. E.—"But you must not go over the black lines". Patient moves

along the black lines to the left and goes off the paper. E.—"But you must not take your finger off the paper". Patient moves straight over the black line again. E.—"But you must not go over the black lines, you must go round them". Patient starts tracing along the black lines again.)

Discussion

It is always tempting, when reviewing and summing up a piece of work, to try to synthesize the findings into a single conclusion and to underline the proof or refutation of one or more hypotheses. Thus from the present piece of work it might be concluded that the performance of seniles on the maze test indicates two kinds of reason for failures; an *over* dependence on the environment on one hand (as shown by the over-riding attraction of the goal, the lines and the gaps), and an *under* dependence on it on the other (as seen in the tendency to lose sight of the goal, and in the inability to respond to more than one instruction at a time). Poverty of memory seems to be an important factor, since the effect of preliminary training wears off abnormally quickly, but that these patients do not completely lack some aspects of memory is indicated by the fact that response to training is seen in their case as it is in normal people.

It is possible, moreover, to regard each of these abnormalities as one part of a single comprehensive defect or "Grundstöhrung", i.e. as individual symptoms of "restricted intellectual grasp" or "narrowing of the field of consciousness". Thus, these subjects show the typical "concrete" attitude of Goldstein (1939), being able to concentrate on only one aspect of their perceptual environment at once.

But such conclusions and summaries do not really assist the understanding and management of the condition itself. Since little can be done to enlarge a restricted intellectual grasp, there is little to be gained from underlining its presence; and the naming of a deficit does not really lead to an understanding of it. As was suggested in the introduction, a study of the stimuli to which these subjects *do* respond and of the conditions influencing their behaviour has considerably greater promise.

From the observations reported here, it seems that the behaviour of patients in a route-finding situation is influenced not only by recent training in allied tasks, but also to some extent by perceptual stimulation of other types. This is in agreement with the findings of other workers, that "warming up" of mental activity assists the performance of actions rendered defective by organic cerebral injury. The most notable example is in the sphere of aphasia (Lashley, 1950), but a similar phenomenon has also been reported in the organic amnesic states (Williams, 1953). It is probably because of the "warming up" supplied by occupational and social therapy that patients suffering from intellectual impairment in old age respond so well to these types of treatment (Cosin, 1954; Donahue, 1950).

It is clear, however, that the route followed by a senile patient is influenced by several factors besides that mentioned above. Disregarding again the physical aspects of the condition, we find that on the psychological side it is influenced by the directness of the route itself (a route going straight to a goal is found more easily than one involving detours), by the amount of "support" afforded by the route (patients prefer moving along black lines to going across open spaces), and by the simplicity of the total setting. At the same time a patient is *not* assisted by the repetition of complicated instructions or by the clarity of the goal itself. If a set of instructions is too complex to be grasped at once, its

repetition only appears to be confusing, and if a goal is too clear and positive the patient finds difficulty in detaching himself from it.

From these considerations it is clear that the supervision of senile patients will not be eased by many of the cues or aids which assist the mentally healthy. A mass of sign posts throughout a hospital will not be any help to a person who does not know where he wants to go. The repetition of instructions (first right, second left, etc.) will not help a person who cannot take them in. On the other hand, the amount of individual supervision required by senile patients might be cut down by other methods such as (*a*) daily training along the route desired, (*b*) a convivial and stimulating (though not too varied) environment, (*c*) the building of houses or institutions which incorporate the cues to which senile patients do respond; i.e. buildings in which they can be left to wander without the danger of their losing their way.

Such buildings are not really impossible to envisage. A ward or house where the toilets (for which the patients are probably searching when they begin to wander) are placed in the most central and obvious position, instead of being discreetly hidden at the end of a passage, and are surrounded by a circular corridor off which all other rooms lead, should assist considerably. In whichever direction he wanders in such a building, the patient will automatically arrive where he wants or is wanted to be, and the amount of frustrating direction he requires will thereby be reduced.

The study of senile dementia, as of all cases wherein normal mental function is impaired, is of interest no less to the theorist than to the practitioner. If dementia is regarded as the loss of intelligence, then it must be concluded that factors which influence the patients studied here are also involved in the behaviour of normal people in similar situations. Thus, intelligence—or at least those aspects of it demonstrated in maze tests—involves (1) Ability to detach the self from the goal and from material "supports", (2) Ability to keep many different aspects of a situation in mind at the same time, (3) Ability to perceive a cue but yet to refrain from responding to it till the appropriate moment, (4) Ability to profit from a past experience even when this took place a long time ago, (5) Ability to find a solution without being "warmed up". Further study of these factors and conditions in normal people and in those suffering from localized lesions of the frontal and parietal cortex, together with the standardization of tests based on these dimensions might well be profitable.

Summary

After clinical observation of some 20 patients suffering from senile dementia in whom spatial disorientation plus a desire to wander created a severe practical problem, some experiments were carried out to assess the factors and conditions influencing the routes chosen by subjects in this condition.

Sixty patients aged 65 to 95 admitted to hospital because of intellectual impairment were tested on a simple visual maze under different conditions. It was found that preliminary training up to half an hour before the test itself significantly assisted performance. Mental stimulation by allied tests had some beneficial effect on maze performance, but the groups were too small for this to be ascertained reliably.

It was noted that in their choice of routes the patients were influenced by (*a*) the direction and clarity of the goal, (*b*) the amount of mental "support" afforded by the route (e.g. the presence of a black line), (*c*) the complexity of the instructions and of the total setting.

It is suggested that these findings might have implications of interest to those caring for the senile dement, and to those interested in normal intellectual behaviour.

Acknowledgments

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FRIEDERICH C. G. SCHEIDEMANTEL: THE FIRST SYSTEMATIC TEXT IN PSYCHOSOMATIC MEDICINE (1787)

By

ERNEST HARMS, M.D.

New York

A YOUNG Hessian physician, born in 1735, who had hoped for an academic career had to return home after his graduation in 1762 because of the death of his father, also a physician, and a fire which destroyed the major part of his home town including his paternal home and property. He put aside his original plans for research and became a general practitioner in his small town. His practice also encompassed the neighbouring Spa at Brückenau and the court of the neighbourhood prince. The medical biographies list him as an able and sage practitioner and credit him with several writings which were frequently used in his time for reference regarding the usefulness of Spas for various diseases. The least recognized of his works, however, is a book published in 1787, nine years before his early death. In the introduction, he designates this work as the "red thread" of his scientific occupation but one which he was only able to produce slowly because of the lack of physical and scientific means. This book, *Die Leidenschaften als Heilmittel* (The Passions as a Means of Cure), is the first systematic presentation of what we today call psychosomatic medicine.

Friederich Christian Gottlieb Scheidemantel lived during the period which saw the dawn of German objective idealism, a philosophy which extended itself into the field of psychology as psychological romanticism and into the fields of medicine and science as the period of the broad deductive systems. Scheidemantel stood with one foot in the strongly biogenetic medicine of his century and with the other he spanned the first decades of the new century with its psychological objectivism which considered "die Seele", the psyche, a real part of the total of man's existence. The psyche was that part to which man owed his capacity to think, but this psyche was also considered the seat of virtue and vice which, together, Scheidemantel designates as the "passions", and which we today consider emotions and affects. This dual position attracted Scheidemantel's scientific interest and it became his mission to investigate, from a medical viewpoint, the relationship of what was later to be designated the psycho-physical parallelism; the influence of the psychic forces upon the body. This position was revived a century later in our psychosomatic medicine. In accordance with the scientific concepts of his time, Scheidemantel went to work systematizing and deductively organizing his observations. The results offer us an impressive presentation of the concepts of the mind-body relationship in the way they were popular during his time.

Die Leidenschaften als Heilmittel is divided into two parts. The first is a psychosomatic pathology which gives an account of the ways in which passions cause bodily illnesses including, at the end of the individual accounts, a short amendment on the natural healing influence of each passion. The second part contains a follow-up of all the passions in their actual therapeutic application and influence.

Both of the major sections are opened with a chapter on general therapeutic considerations. Scheidemantel begins his introduction by rejecting both one-sided physiologic materialism and one-sided spiritualism. But "changes in the body caused by influences from the side of the psyche" are basically evident for him. He is a strict empiricist and starts his argument almost phenomenologically by pointing to the evidence of psychic documentations in facial expressions, in the frown, smile and tears. For evidence of pathological influence he points to the expressions caused by excessive pleasure, desires and dislikes. From this point it is only a short distance to the manifest organic changes due to emotional expression, be they good or bad, such as changes in breathing, palpitations of the heart and changes in blood circulation. These are known areas which can be influenced by emotional upsets. Scheidemantel does not doubt that the whole vascular-motor system, skin temperature, excessive elimination of body fluids, voluntary or involuntary muscular contractions and changes in the nerves ("*Nervensaft*" or nerve-fluid in the terminology of his time) belong to the sphere of symptomatology of direct actions of the psyche on the functions of the body. The basis of Scheidemantel's psychosomatic concept is that the primary channel through which the psyche influences the body is the vascular-motor system. However, this basic insight is worked out in great detail with regard to his qualitative and quantitative values. He discusses in detail the relationship between the momentary intensity and the length of time of a passion's influence with regard to the more or less resistant or vulnerable bodily constitution and the conditions it influences. His presentation of the effect of combinations of passions is elaborate; for instance, when a momentary scare strikes a fearful person or when fear follows a violent scare or the effect of several scare attacks following each other. Similar discussions concern the combination of rage and sorrow. The author is also aware of the influence of environment as a combination factor; for instance, the greater impact of scare in exposure to frost and of rage in hot weather. He also discusses the combination of passions with acute or chronic illnesses such as pregnancy, menses and convalescence. It is here that one realizes the sensitive understanding the author has for psychosomatic conditions.

Scheidemantel proves to be primarily a functional thinker regarding the actual pathological elements. The pathogenic influence of the passions are mainly carried by a contraction, expansion or enlargement of the vascular system. All further influence is a consequence of this.

To emphasize the character of Scheidemantel's thought and aims, I would like to quote the following passage which is so modern that it is astonishing to know it was written 125 years before the concepts of psychoanalysis and individual psychology appeared: "Remembrances of events inducing scare which were imprinted upon the psyche in childhood, insecurity, superstition, the pressure of guilt feelings in the consciousness of having committed a bad deed, and a melancholic disposition make the temperament vulnerable to fear and the start of its influence is facilitated by weakness of the nervous system."

In the first section, chapters follow each other which study the set of major emotions and their effects: scare, fear, sorrow, bashfulness, rage, indignation, joy, hope, love, hate and envy, vanity and ambition, and longing.

The first and longest chapter is devoted to *scare* as a pathogenic factor. Following his well-organized pattern, Scheidemantel describes the experience of scare:

> The bewildered stages of the psyche expresses itself with great vehemence in the motions of our body. The moment a person becomes scared his arms and legs tend to become rigid.

Like lightning, a sensation strikes the pit of the heart; one has a feeling that the thorax is too tight. One gets pale and cold; a chill runs through the body. The skin of the entire body contracts and goose-flesh develops. The eyes seem paralysed and unable to move. The scared person is paralysed; he is unable to make a decision and therefore unable to escape. He remains immobile at the spot where the scare struck him. He has a rapid, short and irregular pulse. The heart trembles or beats so hard that one can hear it. The chest feels oppressed. The breath becomes slow and once in a while with a sigh one tries to gain relief. All limbs tremble and the word dies in one's mouth. Strength vanishes, the nerves become unreceptive, the psyche seems to want to leave the body which is threatened with a fainting spell. Such terrible episodes are caused by a scare and a single word or a rustling leaf is able to bring the healthiest person into such a state.

Following this description of a single scare attack, a similar detailed presentation of the organic process is given. According to Scheidemantel, this organic process is basic to most physical pathology resulting from scare. As we pointed out before, it is the author's general theory that passions influence, at first, the vascular-motor system, the heart and bloodstream, and all other effects result from dynamic deviations of this system. Disturbances explained in this way range from fainting and death due to a scare shock to goose-flesh and hair-raising.

In describing the various disorders which can be caused by scare, Scheidemantel used a great many cases reported in medical literature. He apparently read a great deal and abstracted an enormous amount of material. He proves to be acquainted not only with German literature, but with all European literature. For instance, he frequently quoted the French-Swiss neurologist S. A. Tissot.

The diseases brought on by scare first discussed by Scheidemantel are various forms of febrile conditions. He then continues with hepatitis, menstrual irregularity, unusually strong bleeding, stillbirth, ruptures of the veins and finally diseases of the respiratory system such as hiccoughs, lung bleeding and pneumonia. As can be easily seen, all these disorders are connected with the vascular system. However, he also reports conditions which go beyond this sensitive area. There are swellings and tumours of the female breast due to decomposition of the milk, there are stomach ailments and colitis in which the reaction of the liquid release of the mucus membrane and the gland is the causal influence of scare. In the group of secondary effects, Scheidemantel records cases where the urinary system's reaction to scare was enuresis or an unusually strong release of urine. In a nervous person, scare may cause chronic quivering and trembling as well as paralysis, convulsions, shock and severe spells of depression and melancholia. Finally, he points to cases of hernia and rupture caused by scare.

As mentioned before, Scheidemantel also lists the positive influence of passions. With regard to scare attacks, he reports cases where severe bleeding or menstruation were stopped and fevers, gout, palsy and paralysis were alleviated by the momentary impulse. We today would speak of this as easing an hysterical spasm. He also enumerates cases where scare had a healing influence in mental ailments like hysteria, melancholia, depressions and delirious states. Here, Scheidemantel shows his intense interest in this healing factor of passion which he later develops in the second part of the book in greater detail.

Whereas scare is a momentary shock-like influence, *fear*, the second passion discussed, has a long range influence. After describing, again in detail, the actual process of fear and its organic effect, the author presents the actual pathologies caused by it. Fear has a basic tendency to cause chronic diseases because of its long range influence. Again the vascular system stands in the

foreground with chronic heart conditions, long-ranged irregularities of the pulse, congestions of the vascular system and the lungs as the areas attacked. However, an over-sensitive nervous system attacked by fear may lead to tremors, convulsions or lethargy. Bleeding, menstrual irregularity, diarrhoea, colitis, the various forms of liver and gall bladder diseases, stomach and digestive disorders may also be due to exposure to fear over a length of time. Various types of mental diseases may also be caused by a long involvement with fear as well as language deficiencies like stammering and lesser effects like greying of the hair. Fear is emphasized as a serious secondary factor which would aggravate existing diseases. On the other hand, the author has observed cases where a sudden exposure to fear has improved stammering, dumbness, paralysis and chronic constipation.

Sorrow and its more intense sisters *grief* and *sadness* have similar organic influences as the passions discussed previously. The influences most emphasized are a slow weakening of the functions of the heart, a toxic effect on the blood, a tendency towards malfunction of the glands and digestive processes due to the bad living habits of such sad and grief-stricken persons. It is pointed out that sadness induces a predisposition to strokes as well as to mental illnesses like depression and melancholia. Serious states of long lasting grief in a pregnant woman may have a serious effect upon her unborn child. Sorrow is the passion of the melancholic individual. Scheidemantel observed how much such melancholics "enjoy" their grief. There are no forms of illnesses which can be helped by sorrow or grief.

Bashfulness is explained as a mild form of fear. Its most common physical expression is blushing. It can cause mild physical discomfort of various kinds and is frequently the cause of stammering and other speech deviations.

Rage is almost always connected with hate and a desire to remove the irritating element. Rage has the most intense influence on the vascular system. The disturbances brought on by rage include acute, brief irregularities of the pulse as well as chronic irregularities and spastic conditions. There are certain physical dispositions which give some individuals a tendency towards rage. They are known as the choleric type, but hypochondriac and hysterical types also lean towards easy outbursts of rage. In addition to disturbances of blood circulation and chemistry which can be traced to rage, there are also secondary effects of the intestinal and urinary system. These include liver, gall bladder and stomach diseases—more specifically colitis and other inflammations and ulcerous conditions. Fevers of various kinds, haemorrhages, lung tuberculosis, speech disturbances, convulsions and spells of dizziness, stillbirth and certain menstrual irregularities are also included here. Scheidemantel reports the folk belief that rage may drive bile into a nursing mother's milk and cause serious intestinal disturbances in the infant. From the healing side, rage can assist in overcoming hysterical paralysis, in bringing on menstruation which has stopped and in relieving gout and febrile conditions.

Indignation is described as a mixture of rage and grief. It is considered one of the most dangerous passions because of its lingering, penetrating effect. Some chronic conditions caused by indignation are dizzy spells, stomach and lung ailments, speech disturbances and mental diseases. Scheidemantel proves to be conscious of the basic Freudian postulation of suppression when he writes: "Indignation is most dangerous when it is intense and suppressed." There are also positive influences from indignation.

Joy is the passion with the greatest positive influence of all, and this is especially true when it finds its physical expression in laughter. Laughter

revitalizes the vascular system and through this the entire body. It can help overcome many types of obstructions and constipation, and may even lead to the breaking of internal abscesses or may facilitate child-birth. However, excessive joy and laughter may have a serious negative effect. It can disrupt normal breathing and blood oxidation and cause haemorrhages and veins to burst. Quite a few cases were reported in history where over-joy even caused death.

Hope has effects similar to joy but not as strong. Hope is deeply involved with the total of human experience and is, in particular, the patient companion of the sick. It is the basis for confidence in the doctor. The author sees it as the real basis for all medical and pseudo-medical superstitions and miracle cures.

Love as conceived of by Scheidemantel is erotic and almost Freudian in its nature. He emphasizes the extent to which sound love improves physical and mental health; however, he also points out the consequences of too much erotic excitement or sexual excess. The consequences of unhappy and unfulfilled love and its extreme partner jealousy receive extensive treatment. Physiopathology caused by these passions range from hepatitis to insanity and death. Scheidemantel has also observed national characteristics pertaining to love and jealousy. He maintains that Turks, Italians and Spaniards have a greater tendency towards jealousy and its consequences than, for instance, the Germans. Love for other than human objects has similar but not such intense forms and effects. *Hate* is the passion diametrically opposed to love. In their psychological effects, their negative influences produce the same harmful, abnormal conditions in our body and mind.

Scheidemantel considers *envy* one of the most complex passions. It is that passion with which one tends to be most preoccupied. Anyone who is seriously possessed by envy is difficult to help, and so are the chronic conditions it causes. The envious person is an atrophic individual who cannot properly enjoy life or food. He sleeps little, is deeply melancholic or expends himself in spells of choleric rage. He is predisposed towards lung and stomach sicknesses, but strangely enough some of these individuals live a long life.

Arrogance, *vanity* and *ambition* belong to the same family. Arrogance is based on an unhealthy self-love and preoccupation with one's ego. Many believe it is actually a mental illness. Ambition is the son of arrogance with the addition of instability. Its negative organic effects are similar to those of indignation. Vanity, a member of the same family, is a passion with a strong tendency towards mental illnesses.

Longing, the reverse of arrogance, is a desire not for oneself alone but for a foreign object. It tends to create a loss of appetite and sleeplessness, and if it lasts for any length of time it can be the basis for chronic diseases. Homesickness, a special type of longing, which the author describes in great detail is the most dangerous form of longing.

The most impressive part of the entire book, the general introductory chapter of the second part, deals with the passions as an actual means of treatment and cure. Scheidemantel emphasizes that here he is not referring to the natural positive influence passions may have by themselves but to the actual use of passion as a therapeutic tool applied by the doctor, carefully planned and administered. The author confesses that this is a completely new idea in medicine. Since he was able to find very little material in the literature he had to rely mainly on his own observations and experiments.

Since the vascular system is the vehicle for the passions as agents of disorder so it is the vehicle for them as therapeutic agents, and again their

influence on the enlargement and contraction of the vascular system extends throughout the body. If such influence on the vascular system can assist in curing any disease, there is an opportunity to apply the passions as a remedy. From the beginning, however, Scheidemantel has one special basic consideration in mind; namely, that there are certain illnesses for which there is no remedy in physical medicines. It is with this type of disorder that passions may become an important aid. And a third aspect is brought out in these introductory chapters; that there are diseases which are caused by passions and the application of a correlated passion might help such diseases.

Before determining any practical applications, Scheidemantel points out the negative effects of each passion to make sure that these are ruled out in the planned use. Another preliminary aspect for the author is that the patient be made aware of the role passions have, of the help he can receive when they are applied and that he must co-operate by following directions given with regard to these passion treatments. One application is basic to all use and this is that the patient learns to accept the disease as such, its length and the disagreeable factors the attempts at cure may imply.

We are without specific and detailed quantitative measurements in the practical application of passions. The only quantitative advice possible are such general specifications as weak, medium and strong. The doctor who wants to apply passions therapeutically must realize that simply prescribing them will not be of too much help. The difference between passions and physical medicine is that the passions are an intimate part of the very nature of the patient and the doctor must work closely with his patient in this respect. The basis for a judgment and evaluation in passion therapy is an intimate knowledge of the physical and mental nature of man. The doctor who wants to apply passion therapy must know much about the human temperament (psychology), the differentiation of the various stages of age, the educational and social background of his patient and he must have complete information about the specific conditions of the ailment he is planning to treat. One cannot learn passion therapy from books but only from long years of experience and a sensitive feeling for the very nature of passions.

Passions cannot be produced in a patient simply in a direct manner. The passions are carried through the memory and imagination; therefore, the nature of the patient must be known. Since a quantitative measure cannot be evaluated, the doctor must distinguish carefully between violent or negative passions and positive ones as a basic precaution. Occasionally violent passions will prove helpful in certain conditions, but one must be aware of the danger of using them whereas no such precautions are necessary with the milder passions.

After these general considerations, Scheidemantel again discusses the individual passions in the same order as he did in the first part of the book.

Scare is again given the longest consideration; however, this time as a therapeutic tool. Scheidemantel enumerates a number of disorders like sleepwalking, gout, epilepsy, malaria, paralysis, constipation and dropsy which may be helped by scare therapy. With great detail it is advised when and how to apply it for each case. Again the point is raised as to where the danger of harmful effects or regression is to be avoided. The underlying process in the specific sickness in connection with the effect of scare is also described. Finally, it is emphasized that scare should be used only where all other medical possibilities have failed.

Fear has basically the same pattern of therapeutic influence as scare. The

difference is that scare has a momentary influence whereas fear has a long lasting one. Fear is believed to be especially valuable when intellectual and reasonable advice failed to influence the patient. It seems to be extraordinarily important in ailments brought on by the patient's self-abuse, either from violent passions or vice and physical excess. Fear seems to influence all kinds of haemorrhages and menstrual irregularity, convulsions and chorea, tendencies toward fainting spells, digestive disorders and finally certain mental diseases. There is less danger from serious negative effects in the application of fear than exists with scare; however, serious consideration should be given when using fear to avoid harmful effects.

Grief has no therapeutic value because there are only negative effects. However, it may be useful only if one wants to prevent a patient from unadvisable actions. *Bashfulness* also has very little therapeutic value.

It is not expected that *rage* would have a therapeutic use. However, it proves to be a valuable factor in activating stagnant processes, giving a quick momentary impulse and warming up the body. Rage is a useful therapeutic means with phlegmatic types and with persons who, for one reason or another, refuse to move fast or at all. It has also proved helpful for obstructions of the liver and bile tract, sclerosis, rickets and to induce menstruation in certain types of women. Rage is also helpful in bringing about a catharsis in fevers and as a result it also effects smallpox, measles and chicken-pox. Within the range of mental diseases, rage may be used to break spells of depressions and grief. However, Scheidemantel emphasizes most seriously that rage should always be used in a moderate form to avoid the danger of an uncontrolled rage which may harm the patient.

Indignation is another passion which Scheidemantel discards as unusable in therapy.

In contrast, *joy* is considered the most useful passion for healing purposes. By itself, it is a basic factor for all health and happiness and it represents the best guarantee for reaching an old age. Joy cannot be underestimated as a strengthening factor in all health and therefore it is a primary factor in advancing any cure and completing a convalescence. Of course, there are dangers of over-joy; however, these are more easily controlled than the negative effects of other, more violent passions. Scheidemantel lists 34 different disease patterns in which he sees joy as an active helper. Its basic influence is in the improvement of the general circulation. He lists children's and women's disorders, various fevers, colitis, diarrhoea, lung ailments, colics, catalepsy, the various rheumatic conditions and many mental ailments, especially hypochondria. In each case, Scheidemantel gives detailed conditions for the application of joy. Special emphasis is placed upon its application as a basic factor of cure in children's diseases.

Hope has a similar therapeutic effect to joy but it is weaker and of a more long-ranged efficacy. Hope is an indispensable assistance to the doctor and the author discusses its medical use in great detail. He is very thoughtful in discussing the application of hope in incurable diseases and the effects of unfulfilled hope in recurrent disorders. For homesickness, hope is the only existing remedy.

Love in the biological sense, as Scheidemantel had discussed it in the first part, has no therapeutic value which the medical doctor can apply. He doubtlessly differs greatly in this with the present Freudian psychoanalysis. However, love for non-human objects can be successfully utilized.

Finally there are a group of passions which Scheidemantel lists as unusable

for therapy. These are *jealousy*, *arrogance*, *envy* and *vanity* and empty *longing*.

There is, of course, much in Scheidemantel's thinking which is closely related to the scientific thought of his period. His psychology, although almost modern in some respects, in other respects, especially in the terminology, it is strongly within the pattern of the late 18th century. The same must be said of his physiological thinking and especially of his basic concepts of neurology. But in spite of this, his conception of the body as a whole and of the differentiation of the internal systems and their co-ordination represents beliefs to which much of our recent physiological pragmatism has returned. However, his clear insight into the psyche-body relationship and his realistic insight into psychic functions in this sense is most astounding. In this respect, he is certainly one of the great masters of psychosomatic medicine and practical psychology.

THE PSYCHOSES OF ADOLESCENCE*

By

The late DALTON E. SANDS, F.R.C.P.Ed., D.P.M.

Physician Superintendent
St. Ebba's Hospital, Epsom

THE adolescent psychoses are amongst the most rewarding subjects for study in all psychiatry, not only on account of the considerable clinical interest of these patients, but because no other group affords the psychiatrist quite such an advantage by reason of age alone, an age that covers the peak phase in maturation. The juvenile is young enough for childhood environment to be vividly recalled, the responses to the stresses of puberty are already evident, and in a short space of time the writing of the future adult life pattern will be on the wall. Furthermore, owing to the more likely presence of parents or guardians, sometimes lost or dead by the time one deals with adult disorders, a more comprehensive view of the hereditary influences, and a relatively adequate account of the early formative years, is generally possible.

Until the late nineteen-twenties, few writers paid much attention to the psychiatric disorders of the young, and such as did so kept to the view that they should be assimilated into existing adult classifications. Individual psychodynamics was not popular, and earlier still, in the latter part of the last century, the term "Psychosis of puberty and adolescence" was held to cover all psychotic developments for this age period as a single entity.

In the last three decades there has been a strong shift towards the study of onset and development of psychiatric illness, leading to the investigation and treatment of the behaviour problems of the child and adolescent. The function of the whole personality became the dominating issue, rather than the former over-riding pre-occupation with a cellular pathology. If it was obvious that psychiatric illness in the young used to be something of an appendage to adult psychoses, it is now clear that this situation, if not reversed, is at least levelled out, and that our ideas on the adult psychoses may need some revision to achieve continuity with the outcome of adolescent development. There is no question of adolescent psychoses being in any special classification of their own. Their long-section study illustrates vividly that such conditions are but part of a process begun in childhood and continuing to later life, yet the normal processes of maturation endow the psychoses and other breakdowns in adolescence with some characteristic features, just as happens in other epochs of life.

Three features are particularly characteristic of adolescent psychoses. First, their capacity for variation in duration, intensity and form. They are indeed the unstable pathological deviation from an unstable physiology. In the course of a few days the neurotic reaction may swing to the psychotic, and *vice versa*. Alternatively, phases of anxiety or behaviour disorder, affective disturbance or schizophrenia may succeed one another for little obvious reason. Familiarity with adolescent breakdown has certainly dispersed any lingering possibility of neuroses and psychoses being separate entities, and has demonstrated them to be merely successive stages of the process of morbid adaptation. Another main feature is the readiness with which regression to earlier forms of

* Based on an R.M.P.A. Maudsley Bequest Lecture, 8 November, 1955.

behaviour is achieved, a finding quite consistent with normal 'teen age psychology in which mild and brief regressions are seen in the face of stress. Even pathological degrees of regression at this age fail to carry the ominous prognosis often associated with the same change in the adult. Finally, these psychoses can develop from a setting of conduct disorder in a manner unusual in adults. In retrospect it may be found that stealing, truanting, refusal to attend school, screaming attacks, and behaviour sometimes involving court appearances, have marked the onset of a disorder that subsequently is diagnosed as schizophrenic.

Adolescent psychoses frequently show certain physical characteristics, in relation to which Clouston's observations on puberty and adolescence in 1898 still seem very relevant when he wrote that after straining the brain's potential to the utmost it was fallacious to suppose that there is plenty of energy left for growth, nutrition and reproduction. It is scarcely surprising that, considering the stressful background of most adolescent psychotics, these patients are usually stunted in growth and physical stature, and immature in development of primary and secondary sex characteristics. Testes are sometimes small or undescended, pubic hair abnormal or retarded in growth.

Turning to actual types of adolescent psychotic disorders—from what has been said it follows that the phenomena which can be displayed by adolescent psychoses will be bounded by the individual's degree of personality development and integration. If the patient is immature, so is the psychosis. Because of immaturity certain psychotic patterns seen in adults are either absent or very rare: e.g. classical paranoia and paranoid psychoses, especially those with fully systematized delusional formation, and paraphrenia. Schizophrenic illness is easily the most commonly occurring psychosis, followed by psychotic depression, manic reactions and manic depressive states, organic confusional psychoses, including epilepsies. Such diagnostic labels appear to be useful and valid in adolescence, provided it is understood that the symptom picture and course of illness may differ from the corresponding adult breakdowns.

In order to give a fair picture of the characteristics of adolescent psychosis I have drawn on over a hundred and eighty cases, composed of a hundred and forty-six psychotic and thirty-four borderline psychotic patients, admitted to the juvenile departments of St. Ebba's Hospital in the past six years, and whom I have personally examined.

Schizophrenias. The common denominator in over a hundred such patients was a difficulty in relating themselves to people and situations from early life. This social failure in adaptation was associated with an anxiety which seemed to be intolerable, and they might even be said to be constitutionally allergic to anxiety, and to avoid it by any sacrifice. The diagnosis of schizophrenia should only be made after a definite period of time, perhaps several weeks, and is not negatived by transitory appearance of symptoms more often associated with other forms of illness. Frequently one will find a more lively emotional response than is usual in the adult, and less incongruity of affect. In practice the schizophrenias are of two main types: (*a*) The acute schizophrenic episode, and (*b*) The full attack, with chronicity in some cases. The classical sub-groups of adult life are little in evidence; most cases are of mixed symptomatology, while catatonia and paranoid states are less commonly encountered. The symptomatic emphasis is on social withdrawal, disorders of activity, of interest, speech, and peculiarities of manner. Thought disorder is mainly demonstrated by a vivid phantasy development on a relatively simple plane. The acute *schizophrenic episode* will show some portion of the following com-

posite picture extracted from forty-two cases. From a timid, retiring, socially or emotionally inadequate, or sometimes intellectually dull personality is seen the rapid development of behaviour disorder, with muteness, panicky attitude, a plethora of strange ideas, such as seeing a neighbour looking shrivelled and digging a grave. The body does not belong to them, hands have changed their shape. They may be aurally hallucinated, hearing God's voice; or paranoid, being threatened by Communists. There may be a flight into religion, or into high-sounding ideologies with pseudo-scientific jargon, though actual phrasing is not usually disconnected. Brief catatonic stuporose periods may occur, with refusal of food, impulsive homicidal attacks on relatives, or suicidal attempts. They may urinate or masturbate shamelessly.

For illustration, there was a boy of thirteen years, studious and quiet in disposition, but a misfit in a family of relatively tough youngsters and the butt of his father. He had won a scholarship at school. His condition deteriorated over the six months preceding admission, beginning with anxiety about school work, complaint of pain connected with an undescended testicle, and occasional enuresis. The acute phase began about a fortnight before admission, when table manners deteriorated, he became sullen and aggressive at home, finally singing and shouting through the night, killing two pigeons and breaking into the gas meter. He chased up and down the street with a hatchet, and used much obscene language directed against his father. Investigation of the home showed that he was on bad terms with his father, who teased him about book learning, and the parents themselves quarrelled constantly. The home was overcrowded, the financial position very poor, the marriage having been forced on account of the patient. The mother is said to be highly strung and the father's temper violent. When seen after admission patient was in a state of acute excitement and restlessness, occupied with ideas of impending castration, said he could smell ether and spoke of being stung by various non-existent wasps. His thought content was a mixture of illusion and hallucination. He stated that he was in Wales and various other places, and his attitude was at one time anxious and fearful, at others paranoid and resentful. E.C.T. gave temporary relief, but he relapsed, describing the threatening voice of a man, fear of being poisoned, and knifing. He continued to be disorientated and amnesic. During thirty-one insulin comas he improved considerably, having failed to respond to E.C.T. and continuous narcosis. During subsequent discussions his hostility to his father, his rejection by his mother, and his anxiety at school were evident. The final break came after the death of a friend with whom he had endeavoured to make a substitute home, and after the development of guilt feelings over sex difficulties. Under the circumstances he was resettled in an orphanage, and though his progress was uncertain at first he adapted quite well until two years later he was once more admitted to a mental hospital in a tense, anxious and depressed aggressive state, but this time not obviously schizophrenic. After five months he was discharged to a training centre, only to be re-admitted to a mental hospital five months later, this time with typical schizophrenic symptoms, including bizarre delusions. He is reported to be showing slow improvement again, but is not considered to have responded to insulin comas.

The more chronic and fully developed adolescent schizophrenics show many of the above features in a less acute tempo. Initially there may be a fairly prolonged phase of behaviour disorder, with severe outbursts of temper, stealing and perhaps disposal to an Approved School, though undoubted efforts are made in out-patient departments to single out for hospital care the case of behaviour disorder who may be passing into a psychosis. Alternatively

one has seen a short phase of mania precede hebephrenic illness, and a prolonged obsessional neurotic state is a morbidity defensive manœuvre which may delay schizophrenia for months or years, and at times the obsessional and the delusional idea may be hard to differentiate. Occasionally in adolescence one finds the chronic outcome of Kanner's early infantile autism, also the so-called dementia praecocissima of childhood. Such patients have usually been unsettled and restless from infancy. They show an excessive and persistent dissociation into phantasy life, and are solitary and timid.

The position as regards heredity is that in the acute schizophrenias just over 25 per cent. were known to possess definite hereditary tainting in near relatives, while in the chronic and full-scale attacks the loading was 50 per cent. (compared with 53·8 per cent. of Kraepelin's one thousand and fifty-four adult cases). There was no significant difference between the tainting in the sexes separately.

Examination of personality prior to breakdown showed that abnormal and particularly schizoid traits were found much less often in the acute than in the chronic cases of either sex, being 40 per cent. in the acute and 68 per cent. in the chronic patients. It was noticed that schizoid personality disorders were much more often evident at an early age in the chronic than in acute schizophrenics.

One cannot leave the subject of schizophrenia without comment on the particular position of the mothers of these patients. They specialize in an unstable devotion to their sons, usually over-protectively dominating or indulging their over-dependent offspring. Occasionally they are the target of much aggression, yet such mothers are undeterred, and our department has often been visited by these battered women. On the female side the daughters also tend to be over-protected by domination, or to be ignored, with a resulting ill-balanced attachment to either parent. It is rare that relationships are described as satisfactory.

Borderline Schizoid States. These are an interesting group since, more than most, they are apt to keep one guessing as to the probable diagnosis and outcome. All manner of diagnostic labels are liable to appear in this group, which seems to be only given cohesion by the ever-present possibility of schizophrenic psychosis. To take a sample series of such patients, they are described as anxiety state with schizoid trends, as intellectually dull and schizoid, obsessive and schizoid, schizoid psychopathy, inadequate psychopathic schizoid personality, and schizoid states associated with epilepsy or depression. Many seem to remain in an arrested borderline state of schizophrenia for years, never becoming fully psychotic or only briefly so, and never fully recovered. One might mention particularly the inadequate case with behaviour disorder, who has as it were an attitude of schizophrenia, who may even regress to degraded habits but rarely becomes floridly schizophrenic, though liable to be referred to hospital as such. Amongst this heterogeneous group one sometimes finds a future young recidivist in minor criminality, as the following case shows: A youth of nineteen was admitted in November, 1949, as a case of dementia praecox. His parents had always regarded him as a problem. At school he developed wanderlust, and began to dress in girls' clothes. In 1943 and in 1944 he had periods in two mental hospitals, and is quoted as simple, being unable to give the number of days in a month or year, talking enthusiastically of his vagrant habits, being crafty and appearing to be hiding something. He absconded twice, and returned home regarded as unchanged. At home he ran through innumerable jobs, interspersed with housebreaking, until

in November, 1949, he was charged and sent to Wormwood Scrubs. In prison he was noted to have auditory hallucinations, ideas of reference, feelings of unreality and suicidal thoughts. Passive homosexual experience was admitted. Investigation in the Juvenile Department of this hospital revealed an unhappy home life on account of parental quarrels, the infidelity of his father, and a mother who herself had mental illness. Patient was apathetic and vague, indefinite about auditory hallucinations, mildly depressed, and generally making an unstable impression. He made some improvement after three E.C.T.s, but continued to show inadequacy and panicky feelings. In crowded places he had a compelling desire to ask people if he had seen them before. He managed to hold a job outside of hospital while still living in for a time, but eventually absconded. In 1950 and 1951 there were further hospital admissions, and also periods in Wormwood Scrubs. During the former a full course of insulin coma therapy was given, but doubts were expressed as to the veracity of his hallucinations and tales of impulsive desires. He eventually returned to his parents, but after several hotel jobs he was again charged with housebreaking and larceny. Further hospital care followed, with subsequent discharge and resettlement in work.

In an allied category was the youth of sixteen years, son of rigid, dominating, over-anxious parents, he suffered an acute sense of social inferiority, had homosexual trends and a tendency to much self-adornment. He compensated with strong views on art and religion, stating that he would become a great Islamic religious leader, and that he could read people's minds. Though in fact immature mentally, he posed as pseudo-sophisticated and was very condescending. As in many such types, symptoms are apt to be worse at home and are mainly of a defensive character, usually to the parental attitude.

Follow-up. Eighty-five per cent. of adolescent schizophrenias can be discharged home. It was possible to follow up 70 per cent. of the schizophrenic discharges for periods varying from two to four years. Although the recovered improved rate of the acute schizophrenic group was high, so was the relapse rate, since of twenty-six such patients thirteen relapsed during the follow-up period. However, of this thirteen, only four still require hospital care, so that the long-term outlook would seem more cheerful than the 50 per cent. relapse rate would suggest.

In the more chronic group with full-scale schizophrenic illness, out of forty-five patients followed up twenty-one relapsed, six of them more than once, and nineteen remain in hospital care, while two more needed much supervision at home. Some twenty-two cases have made a fair to good adjustment at home. If all cases are combined, the result has been that thirty-one out of seventy-one (i.e. 44 per cent.) schizophrenics have made a satisfactory recovery or improvement out of hospital care over a two to four year period of follow up.

Follow-up of the borderline cases indicates that in a fair proportion the risk of schizophrenic development was real enough. Out of twenty-three cases traced, seven are in mental hospitals, two in approved schools, many others needing substantial degrees of care in homes or hostels, and only a few appear to be attaining any kind of stable adjustment. In fact their prognosis is apparently rather worse than for the more orthodox forms of schizophrenia.

Affective States. On the whole it is more difficult to be sure of diagnosing psychotic depression in adolescence than in adult life, and the incidence is decidedly less than that of schizophrenia at this age period; the latter being more numerous in hospital practice by three to one. The previous personality

of the depressive is usually better integrated than that of the schizophrenic. Compared with adult depressions they are more readily influenced by their environment, e.g. their attitude in the consulting room shows more variation from that in the ward. Their very depression, like the whole adolescent make-up, is less fixed. This description might seem halfway to an hysterical depression, but while it could be academically interesting to carry the issue further, the resulting attitude might be clinically dangerous. Many of these depressed adolescents have broken down under severe stress at home, and are predisposed by heavily tainted heredity. Symptomatically the picture can be florid, and definite suicidal attempts, by aspirin, cut wrists, gas and strangulation, were made in one-third of all cases. Depression is often preceded or accompanied by conduct disorder, such as truanting or aggression, with attendance in Court, anxious obsessive rumination and guilt. If a psychotic degree of depression has once been established it is advisable to continue to treat the patient as such, even if neurotic phases seem to occur, until full remission is quite evident. In the male, depression is often coloured by anxiety, and in the female by hysteria. The depression is often reactive to anxiety over parents, siblings, school, guilt over boy or girl friends, and over masturbation. In one case the patient, a girl of fifteen, lost her father, showed conversion hysteria, became depressed and highly antagonistic to her hard, rigid mother, made several suicidal attempts and became wildly aggressive, mostly against herself by tearing her hair, banging her head, etc., needing hospital care. Another girl became depressed through conflict over her stepmother and natural father, fearing to lose the natural parent if she fled from the stepmother. In another instance parental quarrels, sibling jealousy, parental psychosis and changes of home proved too stressful for a boy of fourteen. Immaturity may provoke depression as a response to reluctance to leave school and to face adult life, occupations and sex problems. These are samples of the kind of settings in which psychotic adolescent depression can appear. Eighteen of these patients have been followed up over two to four years. Three have suffered temporary relapses of depression, and two have developed psychopathic personalities. The rest are well and prognosis of depressions at this age would appear remarkably good.

Manic depressive illness is very rare in adolescence, though there is one patient under my care who is reputed to have had authentic mood swings since the age of twelve. If real cyclothymia is unusual, manic attacks are a little more common. In six years there have been four patients, two male and two female, who showed nothing more than a classical manic attack with a euphoria, over-activity, flight of ideas, mischievous behaviour and an aggressive reaction to adversity that could hardly have been bettered by any adult. They mostly regressed to an earlier level of behaviour, and a fourteen-year-old boy behaved like one of nine. These attacks sometimes result from a period of overstimulation, contact with adult ideas and activities proving too much. They avidly take on too many interests at one time, only to collapse with acute mental indigestion, as it were. In a few, a manic reaction ushered in a schizophrenic illness, and it is necessary to differentiate mania from mere overactivity without euphoria, sometimes associated with epilepsy, organic states and anxiety neurosis. Some mental defectives, perhaps pressed beyond their capabilities by parents, lapse into manic episodes, recovering rapidly when the precipitating trauma is relaxed. Seven patients who have had manic types of attacks have shown no relapse; one is at Cambridge and another has passed the general certificate of education.

The other disturbances which may reach psychotic proportions in adolescence are those associated with epilepsy and the organic states. Such patients have proved extremely difficult problems, since not only have organic traumas caused arrest of intellectual development, but also of emotional and social maturation, resulting in very damaging personality changes and delinquency. One sixteen-year-old schoolboy of previously clear history required four years of intensive care and training, with three mental hospital admissions, to readjust after a blow on the head in the swimming pool had precipitated violent psychomotor attacks on other boys, the school matron, stealing and spells of depression. In another instance an attack of tonsillitis precipitated a hyperkinetic confusional state with fits in a constitutional epileptic. His behaviour and attitude temporarily regressed by some six years, and during recovery he developed an hysterical overlay, with excessive dependence and attention-seeking conduct. Eighteen months later he is well, fits are under control, but moods liable to instability with undue elation and depression.

Treatment. One cannot pretend to speak comprehensively on therapeutics in a paper of this nature, so my comment must be restricted. Since therapy must be correlated to the individual, one uses methods from both child and adult psychiatry. The particular line taken will usually depend on an estimate of how far the patient has matured intellectually, emotionally, socially and physically. Unless the breakdown is mild and brief, or private nursing possible, some form of residential care is required. There is no formal provision for adolescent or juvenile psychoses in this country, and such patients have generally had to make do in institutions primarily intended for other types of disorder. Mental and mental deficiency hospitals, approved schools, observation wards and homes of one kind or another have taken the occasional case with reluctance. A very few hospitals have made special provision for their care, and these have gone some part of the way to ensure that residential treatment shall be therapeutic rather than carry risk of an additional trauma.

Adolescent breakdown almost invariably springs from a background of considerable stress. The very detachment of the patient from the immediate vicinity of stress to an environment of kindly support is in itself a first step in treatment, and at times sufficient to allow recovery to take place. This is in line with the observations of Eugen Bleuler on schizophrenia, the therapy of which he described as most rewarding to the physician who does not ascribe the results of the natural healing process to his own intervention. One must admit that not only is resistance to psychotic mental illness strong in adolescence, but that the drive to regain equilibrium is also considerable. So long as there is no need to relieve urgent symptoms, it is not a waste of time to delay initiating any particular line of treatment, but rather to allow enough opportunity for personal interviews to understand the patient, and to discover how he or she develops once the impact of coming into an adolescent ward has levelled out. Investigations such as psychological testing and EEG examination can conveniently be pursued in this phase. If no signs of spontaneous remission appear, one has to try to decide what factors or stresses are inhibiting it. In a psychotic illness in adolescence these sources of stress are usually multiple, often implying that no single therapeutic approach is likely to succeed, and in planning treatment it is often necessary to range over various psychological, physical and social methods.

The principles of psychotherapy are substantially those valid for adults, except that one has to rely to some extent on information gained from play activities or occupational situations almost as much as is usual in child psychi-

atry, these activities being, of course, suitably adapted for the more advanced age involved. If no more is said on this point it is not intended to belittle its obvious importance, but I would emphasize that since a number of persons, the doctor, nursing staff, school teachers, social workers, psychologist, occupational therapists, may all play a role in exerting some form of psychotherapeutic influence, at times quite unconsciously, it is necessary that frequent meetings of this team be held to maintain a common policy, to avoid contrary advice, or to prevent the patient using one member of the staff to gain advantage for himself over another.

The place of physical methods of treatment in adolescence is of some interest. Insulin comas, E.C.T., prolonged sleep, various forms of sedation and even rostral leucotomies occasionally have their uses, but less often than in adults. In fact it may be that studying the responses to physical methods in juveniles will eventually assist us to be more selective in adult therapy, and waste less of the patients' and doctors' time in unproductive or even damaging work. In the adult the diagnosis of early schizophrenia with a history of two years or less has become routinely linked with the administration of insulin coma. Some 40 per cent. of the hundred and four adolescent schizophrenics examined personally were acute. Half recovered or improved spontaneously, and the rest were given insulin when spontaneous gain was not evident, or when symptoms had to be brought under control. Only two failed to improve, thus raising the suspicion that more waiting might have produced more spontaneous remissions. However, there are obvious reasons why the wait may have to be limited by treatment, and on the whole the risks of waiting too long are greater than of too little patience. This view finds further support when sifting the more chronic cases, two-thirds of whom were given insulin comas, but with results far inferior not only to the acute types, but to those generally obtained in adults of comparable duration of illness. The influence of age should be noted. There is a tendency for results to improve as age increases from eleven to twenty. Very little success was achieved from eleven to thirteen years. There was a distinct swing towards better results at fifteen years in the more acute, and between sixteen and seventeen years of age in the more chronic cases. Other authors have noted the poverty of results in the very young. It is possible that the response to insulin therapy may be partly linked to the stage of endocrine development, a point at present under biochemical investigation.

E.C.T. is less frequently needed in the adolescent. Its main use is to gain symptomatic control in the acute schizophrenic, to support insulin comas if progress is slow, or if evidence of affective disorder becomes prominent. Depressive psychosis in adolescents often does not need E.C.T., only four out of thirty-two requiring it, though the few treated responded well. It has been less used because entry into hospital alone can stimulate remission in the young, and because recent drugs, on which some comment will be made, have played a part.

Leucotomy also has a very limited role in adolescent psychoses, and the results are not comparable to those of the adult. The chief reason for this discrepancy is that it is scarcely ever necessary to consider leucotomy in the affective disorders of adolescence. Even if comparison is limited to adult schizophrenias, the adolescents still show up unfavourably, Nearly all the eighteen cases known to me were very chronic schizophrenias. Approximately a third of these made some lasting improvement (five out of sixteen), but not more than two patients of the eighteen undergoing leucotomy between twelve and nineteen years of age have been discharged by virtue of the operation

itself. Most of the improvement has been in the more aggressively disordered patients, and in a few the operation has enabled further improvement to be made with E.C.T. or chlorpromazine, which could not be had before. None were made worse.

If the more drastic physical treatments have proved less effective than in adults, there has been compensation in other directions. Much help can be obtained from varying degrees of sedation and narcosis, modified insulin, chlorpromazine, methylamphetamine (methedrine), oestrogens and adrenal steroids. If the reasons for breakdown are often multiple, so are the possibilities of treatment, provided the method selected can relieve the trauma to the patient in some definite way. Some patients seem to be able to adapt to numerous difficulties, but eventually the last straw which precipitates illness arrives. Equally it is fortunate that it is not necessary to relieve the patient of all adversity before improvement supervenes. To restore the situation in but one direction may be enough to bring about a remission, even if more treatment is required to maintain it: To settle the acute stages of illness, a few days' narcosis was often useful, but has been largely superseded by intramuscular chlorpromazine for three days, thereafter changing to oral route in doses up to one hundred milligrams thrice daily. The young, when arrived in the strange atmosphere of hospital, are if anything less ready than adults to part with information essential to the understanding of the psychodynamics of their case; they will defend the parent with whom they have been at loggerheads, when discussing issues with a comparatively strange doctor. Methedrine or chlorpromazine can both assist psychotherapeutic enquiry.

Lately there has been promise of further treatment from the endocrine angle, a somewhat obvious field when one considers the important role normally played by the endocrines in the development of juveniles and adolescents. Much attention has already been given to the relief of symptoms and to the psychotherapeutic re-adaptation of the patient to environmental stress. At times the environment itself has been modified by changes of home, occupation and so on. However, it is also true that our case material is constitutionally unstable, and for constitutional reasons may continue prone to breakdown unless normal adult homeostasis can be achieved. Constitutional factors may well provide the answer to the question why one out of several youngsters in a home has become psychotic, when all have been subject to the same atmosphere of, say, perpetual parental quarrels and alcoholism. If it were not already evident in clinical practice, one would know from the careful studies of Bowlby (1947), Widdowson (1951) and others how chronic emotional stresses causing tension and anxiety in the child can delay maturation of intelligence, emotional stability, social and psycho-sexual development, and normal growth of the body generally. The accepted physiological variations in endocrine development in adolescence are considerable, but are tolerated in a subject whose personality is reasonably stable and well-integrated, just as such people adapt to other stresses of ordinary calibre. In those whose adaptation is already abnormal it is possible for the onset of puberty to alter the clinical picture drastically. For example, there is the youth who until fourteen years of age could never stand up for himself and was socially inadequate. In a short period he became violently aggressive, first towards himself and then against others. In another instance a schizophrenic child became temporarily aggressively psychopathic at puberty, only to lapse again into schizophrenia in adulthood, when the initial impact of puberty had passed.

When endocrine function is abnormal in the psychotic adolescent, it may

show a temporary disturbance coincident with the acute temporary psychotic illness, and will usually regain balance with the recovery of the psychosis. In relation to this, repeated measurement of thyroid and adrenal cortical function has prognostic value. If there is no disorder of endocrine function, then it is likely that the case is either very chronic or of very recent and mild character. Many adolescent psychoses not only show biochemically measurable deviations of endocrine function, but clinical abnormality in the form of undue hirsutism or the lack of it; gonads that are too large or small, or undescended; pubic hair abnormally developed in quantity and distribution. In an adolescent whose psychosis is still recent but not spontaneously remitting, and in whom there are deviations in thyroid, adrenal, gonadal or pituitary function, it is possible in some cases at least to precipitate improvement by correction of the endocrine balance by stimulation or suppression of the endocrines most involved. In the adolescent such temporary treatment may be enough to restore normal function, though in some, as with the adult, substitution therapy may be needed for years. In the chronic adolescent psychotic one frequently finds that even if endocrine function is restored, no decisive effect is obtained, even if, for example, testes and pubic hair develop normally after treatment, and biochemistry is also normal. Further studies are proceeding on a project which promises to become useful in some but certainly not every patient.

To have an adolescent ward is in itself some advance, and ideally its character should be such that mere admission to it is of therapeutic value to the patient, and the means of fostering any tendency to spontaneous remission. The worst obstacle to maintaining its therapeutic value to the psychotic and neurotic case is the inevitable presence from time to time of too many psychopathic or delinquent types, who by their aggressive antisocial conduct increase the anxiety and tension of the rest. Except for the diagnosis of doubtful cases, these last types do not need mental hospital care, and there is much need for their incorporation into a separate wing of the special institutions now being considered for adult psychopaths. The therapeutic value of the ward itself is greatly reduced if not linked to a programme of educational and social activities. Routine schooling and formal occupation is best provided in accommodation near, but separate from, the ward itself, so that such activities provide a complete change of atmosphere from the ward. Informal activities such as games, modelling, sewing, etc. are done in the ward itself in the evenings. It is essential that the programme should not leave too much time for the group of adolescents to be at a loose end with itself, though a few such periods can be very informative, if not too stressful to the staff.

Finally, it can be said that the adolescent psychoses form a group of great interest to psychiatrists normally occupied in the care of either adult or child. These psychoses do not seem to be numerically formidable, but one cannot tell their incidence, since some are kept at home till they improve or enter adult hospital wards, others go to a great variety of disposals.

The special features of adolescent psychiatric states may well make for reconsideration of the significance that should be attached to symptoms as such. A glance at some case records might suggest that the mere stockpiling of symptoms, without much reference to the underlying process, was a desirable pursuit in itself. To the psychiatrist they serve to indicate more than the needs and possibilities of the moment. It is surely the fluctuation in symptoms, with consequent change in the clinical picture, which not only indicates that breakdown is present, but how far it has gone. As psychopathic behaviour merges into neurosis, and neurosis into psychosis, one cannot defend the idea of any

essential separation of these states. They show themselves as stages in a process which, if not arrested, will eventually lead to complete disorganization of the personality, or to stupor, the ultimate in the progress of retreat. In the adolescent these various stages may be passed in a few weeks and then reversed, and much more rarely symptoms can be as chronically fixed at any stage as happens in an adult. Little is known of the reasons why in a group of clinically similar cases some will spontaneously remit and others, in spite of therapeutic efforts, become chronic. Further study of the behaviour of the biochemical reactions of the adrenals, thyroid and gonads to stress shows some promise of being prognostically useful, and may yet throw some light on why male juvenile schizophrenic development is often preceded by an anxiety state, and the same psychosis by an hysterical reaction in the female. The term adolescent psychosis in itself is just as vaguely descriptive as any other of our psychiatric labels. If it means anything it is that in this epoch there is a new opportunity to study the development of mental illness, to observe which factors do or do not influence its course, and to modify the clinical state before morbid responses become irretrievably fixed.

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COLOUR-FORM RESPONSE AS A FUNCTION OF MENTAL DISORDER*

By

J. D. KEEHN

and

AIMEE SABBAGH

American University of Beirut

ALTHOUGH Külpe (14) used only three subjects in his original experiment on tachistoscopic memory in 1904 his classification of them into colour, form and intermediate types has initiated a substantial amount of psychological research all over the world. Thus investigations into both normal and abnormal personality correlates of reaction to colour and form have been carried out in France (8), Poland (1), Italy (5), (18), Japan (17), Britain (6), (9), (16), America (4), (23), Sweden (2), (15), and Germany (20), (21) to quote but a representative sample.

In general two major findings emerged from the earlier experiments: that reaction to colour decreases with age after the first year or two and that colour and form reactivity tended to go with pyknic and leptosomatic body build respectively. However a survey of the literature indicated that a wide variety of different types of colour-form tests had been used by various workers, and that the evidence available (Eysenck (9), Clarke (6), Thurstone (23)) suggested that these tests were not all measuring the same function. Consequently a number of colour-form tests were constructed and factor analysed showing that a single factor of reaction to colour could be isolated but that any single test would not be a good measure of it, Keehn (13).

A battery of colour-form tests based on this analysis was constructed and administered to small groups of psychotic and neurotic patients (12). Results from this study confirmed previous reports by Eysenck (9) and Clarke (6) that neurotics did not perform significantly differently from normals on these tests, thus indirectly refuting the hypothesis of Schachtel (19) and others linking reaction to colour with emotionality. In addition the schizophrenic group showed more reaction to colour than the manic-depressive patients in contradiction to Kretschmer's typological system which would require the schizophrenics to be form dominant. Similar findings of schizophrenic reaction to colour have also been reported by Campailla (5) and Rubino and Scoppa (18).

As single tests of colour-form dominance have also been used with other clinical groups like epileptics, spastics, mental defectives and organics by Blomqvist (2), Cotton (7), Bolles (3) and Goldstein and Scheerer (10), it seemed worthwhile to investigate the differentiating ability of the colour-form battery between such groups. For a test to have any validity clinically it must be able to separate clinical groups from each other and not just from normal populations. Theoretically the point is important too, for if we are to discover, for instance, the psychological dimensions of schizophrenia it is not sufficient just to show

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how this group differs from normals, but also how it differs from other groups of subjects. We have already demonstrated that schizophrenics are significantly more colour reactive than normal and neurotic groups suggesting that colour reactivity is a function of schizophrenia. It is now pertinent to investigate whether colour reaction is a function of schizophrenia alone or whether similar reactivity is also shown in other groups.

Procedure

Groups of 35 schizophrenic, 10 epileptic and 9 defective patients of average ages 27, 24 and 18 years, respectively were given a battery of colour-form tests based upon that described by Keehn (11, 13). Specifically the tests were:*

4. *Memory: Paired associates.* Four letters had to be associated with four coloured shapes. Colours and shapes were later interchanged to see which category had been associated with the letters which were in the Arabic script.†

10. *Odd one out.* Of nine coloured figures on a card only one was green and only one was a square. The subject was asked to pick out the odd figure.

13. *Common elements.* Three similar figures had to be chosen from eight and could be selected either on the basis of colour or form.

8. *Grouping.* Twelve squares set out on a background could be grouped either by colour or by their disposition on the background.

12. *Stepping Stones.* The subject had to pick his way across a set of coloured figures from one point to another. Two correct paths were available, one based upon continuity of colour and the other on similarity of shape.

22. *Card Sorting.* A pack of cards with coloured symbols on them had to be sorted into four groups. Most of the cards could be sorted by colour and shape combined but four cards could be sorted in one way only.

19. *Weigl Sorting.* Nine coloured wooden blocks, three square, three triangular and three circular could be sorted by colour or shape.

Two tests in the original battery were omitted, the tachistoscope test for technical reasons and the tossing test because its procedure was not found suitable for Arab subjects. In addition neither of these tests had shown significant differences between the original normal and schizophrenic groups in the earlier study.

Results

Table II shows the mean scores and variances of the respective groups. Scores were obtained by weighting each test as shown in Table I, colour and form responses being scored positive and negative respectively. These weights were obtained from a factor analysis of the responses of 200 normals to the battery (13) and were calculated from the factor loadings by the Ledermann method described by Thomson (22). The reported mean of 43·5 of the original schizophrenic group (12) was hardly affected when recalculated without the tests omitted from the present study. The mean of the present schizophrenic group does not differ significantly from this. Furthermore turning to the percentage of subjects giving the colour responses to the individual tests, Table III, it is clear that on tests 4, 8, 10 and 12 the two schizophrenic groups are highly

* Complete descriptions and administration instructions for the tests have been reported elsewhere (11) and will not be repeated here. The numbers by the tests are carried over from the earlier investigation; the tests are listed here in the order given in this study.

† Testing was carried out by Miss Sabbagh. The Arabic language, the native language of the patients, was used throughout.

TABLE I

Test Weights: Positive and Negative Scores are Given for Colour and Form Responses Respectively. Failure to Respond is Scored Zero

Test	4	8	10	12	13	19	22
Weight	30	06	21	19	18	15	31

TABLE II

*Group Means and Variances of the Weighted Battery Scores**

Group	N	Mean	V
Schizophrenic	35	30·11	4294·84
Epileptic	10	32·90	2307·70
Defective	9	86·11	2522·10

* Positive scores indicate a preponderance of colour responses. The epileptic scores are to be treated with caution as 7 and 4 subjects failed on the two most highly weighted tests respectively.

TABLE III

Percentage of the Various Groups Failing or Giving the Colour Response to the Individual Tests. Schizophrenic A is the Original Schizophrenic Group (12). Schizophrenic B is the Present Sample

	Percentage of S's giving the Colour Response				Percentage of S's Failing to Respond		
Test	Schizophrenic A	Schizophrenic B	Epileptic	Defective	Schizophrenic B	Epileptic	Defective
4	56	51	30	67	26	70	33
8	68	74	90	78	3	0	0
10	60	66	80	67	0	0	11
12	72	54	50	89	23	30	0
13	80	71	60	100	6	20	0
19	68	40	50	78	3	20	0
22	64	46	10	56	11	40	22

similar. On tests 12, 22 and 19, where the percentage of schizophrenics responding to colour have fallen appreciably, tests 12 and 22 did not differentiate between normals and schizophrenics previously and still do not do so. On test 19 the combined schizophrenic group is still significantly different from the original normals at the 0·001 level and the new group alone borders on the 0·05 level of significance. All in all, then, the second schizophrenic group responded to the tests in similar fashion to the first group and thus we may take the original finding that schizophrenics are significantly more colour reactive than normals as confirmed.

However turning to the epileptic and defective groups we find reaction to colour not restricted to the schizophrenics, Table II. The figures for the epileptic group are suspect owing to the large number of failures on the individual tests as shown in Table III. On the only tests which this group managed to perform satisfactorily, the grouping and odd one out tests, they reacted more to colour than either of the other groups but not significantly so. Using a large group of epileptics Blomqvist (2) found a high proportion of colour reactors among them. However he used Lindberg's Ring test (15) which has since been shown to be a measure of whole-part rather than of colour-form attitude (11). As for the defectives in all instances a greater percentage than the

schizophrenics responded to colour, significantly so at the 0·05 level on tests 12 and 19. However these differences may be artifacts as in both tests the schizophrenics scored lower than the previous schizophrenic group and on test 12 in particular the failure of eight schizophrenics to complete this test may have seriously disturbed the results. Neglecting these subjects the difference between the groups on the tests does not attain statistical significance. Furthermore on combining the two schizophrenic groups on test 19 the difference between these and the defectives becomes non-significant.

Despite the fact that we cannot be sure that differences between defectives and schizophrenics on any of the individual tests are significant the mean scores on the battery as a whole do differ significantly beyond the 0·05 level, Table II. Although with such a small defective group we cannot be sure of the stability of this difference it is very unlikely that further cases would reverse these findings and lower the defective mean significantly below that of the schizophrenics.

Our results show, then, that reaction to colour rather than form on a battery of colour-form tests is not specific to schizophrenia but is also a function of mental deficiency. Inasmuch as earlier workers on colour and form attitudes have shown that children also react more to colour than to form, our results support the findings of many other clinical tests that both schizophrenics and mental defectives respond more like children than like normal adults. That this is not due to intelligence alone is suggested by Keehn (11) whose results show the average correlation between the present tests and the Raven Matrices Test to be only —0·04. The largest single correlations of —0·27 and —0·22 between response to colour on the card sorting and memory tests and intelligence respectively are reflected by the relative failure of the defectives on these tests.

Summary and Conclusions

A battery of colour-form tests developed in previous investigations had shown schizophrenics to be significantly more colour reactive than normal or neurotic subjects. The present study was designed to see whether response to colour in this sense was restricted to schizophrenics or whether other abnormal groups would behave likewise. Inasmuch as the majority of the earlier work with single colour-form tests had suggested that schizophrenics would be form reactive it was also imperative to cross-validate the original findings.

The present results clearly confirmed the original findings both with respect to the test battery and with respect to the individual tests. However mental defectives responded, if anything, even more to colour than did the present schizophrenic group. A group of epileptics experienced more difficulty with the tests than the other two groups but on the two tests which they were able to do they responded more to colour than the other groups.

Inasmuch as earlier workers had also shown colour reaction to decrease with age the present study confirmed previous clinical findings that schizophrenic and defective patients respond more like children than normal adults. As the present tests showed little correlation with intelligence it was concluded that this similarity did not depend upon cognitive factors.

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SOME ASPECTS OF THE GANSER STATE

By

MILO TYNDEL, M.D., Ph.D.(Vienna)

The Hospital for Mental Diseases, Brandon, Manitoba, Canada

Introduction

Although described as far back as 1898, the Ganser state is still a subject of controversy and causes discussions regarding its existence as a clinical entity, its psychopathology and its incidence. Lately, Goldin and Macdonald (1955) endeavoured to clarify the meaning of the Ganser state after a critical review of the literature. They provided an illustrative case report with some hitherto unreported features and psychological test results. Although their paper presents a wealth of valuable material, there are still some points which need further discussion and elucidation.

The aim of the present paper is the following:

I. To contribute to the elaboration of a proper definition of the syndrome and prominent symptom of the Ganser state.
II. To present the occurrence and the psychopathology on the basis of the author's personal observations.

Definitions and Symptomatology

Goldin and Macdonald quote the definitions of Ganser state published from 1898 to 1954. In addition to these, I would like to quote a few definitions from recently published textbooks which seem to show a better approach to the understanding of the syndrome. According to Noyes (1953), "The Ganser syndrome with its combination of instructive, rational, purposeful and deceptive elements and theatrical behaviour is an alteration of consciousness allied both to simulation and to dissociative dream states". Discussing hysterical pseudodementia, Mayer-Gross, Slater and Roth (1954) state that this syndrome is clinically identical with Ganser's syndrome: "In this condition there is not only a failure of memory and abrogation of intellect, but also the acting out of an artificial psychosis, with bizarre behaviour, attacks of excitement or stupor. The hysterical basis can be shown, sometimes, by the patient giving a response which is the direct antithesis of the normal one, or otherwise giving evidence that there is a secondary distortion of what would otherwise have been normal behaviour ('Vorbeireden')". Finally, Gruhle (1952) calls "so-called Ganser's states, twilight-states of the mildest degree in which the behaviour of the involved person lies between genuine disturbance and simulation. There are senseless primitive reactions, deliria and features of the amnestic syndrome". Gruhle would not agree with the denomination "twilight state"; the states of disorientation and of dementia are but apparent.

As to the symptomatology, Noyes lists among the conspicuous features the "childish, ludicrous performance of simple acts with the correct manner of performing which the patient has been fully familiar. The patient's responses to questions are wrong, but are not far wrong and bear an obvious relation to the question. His replies show that he understood the meaning of the questions, but

they are beside the point and are in the nature of approximate answers—a phenomenon known as paralogia, or 'Vorbeireden' ".

Analysing the meaning of "Vorbeireden", which is the most striking feature of Ganser's syndrome, Goldin and Macdonald came to the conclusion that the English translations of the German expression "Vorbeireden", namely talking past the point, talking beside the point, and talking at cross purposes, do not correspond to the essential symptom as described by Ganser. These authors believe it necessary to go back to Ganser's own word "Vorbeigehen" which means to pass by, expressing the patient's "passing by" the correct answer to a question and giving one near to it. However, since most psychiatrists use the German "Vorbeireden" in connection with Ganser's syndrome, the word "paralogia" as used by Noyes might be considered. But there is some difficulty in this respect. Noyes himself defines paralogia "as a condition in which the patient's reply shows that the question has been understood, but in which the answer, because of defective reasoning, is erroneous, due to the dereistic thinking to which the schizophrenic is particularly given". In Dorland's *Medical Dictionary* (1952) we find the definition of paralogia: "Impairment of the reasoning power marked by illogical or delusional speech". This definition of "paralogia" does not imply the purposeful factor of the symptom and therefore does not correspond to its classical meaning. Thus it appears preferable to maintain the use of "Vorbeireden" without trying to translate it into English, but to explain it by "passing by" (Goldin and Macdonald).

Occurrence and Incidence

Most cases of Ganser's state described in the literature occurred among prisoners under detention awaiting trial, or, generally speaking, in persons who have a strong desire to appear irresponsible because of a mental disorder. Sarteschi (1953) states that it occurs only in civilian and military prisoners, and in persons seeking compensation for accident. The case described by Goldin and Macdonald as well as my own observations show that there are also other motivations for developing Ganser's state. In this respect we have to disagree with Gruhle, who wants to separate the so-called war neuroses and accident neuroses from the peculiar psychological reactions which appear as clouded states or as Ganser's states and in which the patient's behaviour lies on the borderline between genuine disturbance and simulation.

In the case of war and accident neuroses, the most prominent aetiological factors are the undesirable side-effects of compensation legislation insofar as they awake wishes for compensation, incite a struggle for the latter and generally stimulate a querulous attitude. In my opinion there is no difference in principle between these reactions to catastrophes, imprisonment, legal trial and struggle for compensation, all of them being primitive reactions.

This viewpoint leads to the assumption that the condition is not so rare as Goldin and Macdonald believe. As a matter of fact, the increasing legislation for social security in many countries leads to peculiar psychological reactions, some of them in the sense of Ganser's syndrome, under special circumstances and in certain personality types.

Personal Observations

My observations were made on the examinees of the General Disability Insurance Institute (Allgemeine Invalidenversicherungsanstalt) in Vienna

during the years 1950–1954 and the Employees' Insurance Institute (Angestelltenversicherungsanstalt) during the years 1953 and 1954. For a better understanding of the following observations it is necessary to outline briefly the legal and social aspects of this matter. Since 1938 the social security legislation in Austria has been based on the German Social Insurance Law (Reichsversicherungsordnung). Employees and manual workers have separate disability insurance institutions, the former being insured with the Employees' Insurance Institute, while the latter are insured with the General Disability Insurance Institute. The social insurance is split into the sick fund institutions and the above-mentioned disability institutions. Where sickness exceeds 26 weeks the patient no longer receives his sick leave pay but is referred to the General Disability Insurance Institute or to the Employees' Insurance Institute for assessment of his remaining working capacity in respect of somatic or mental condition. Manual workers are considered temporarily or permanently disabled if their remaining working capacity as referred to the general labour market is less than one-third of the average income under similar circumstances. Employees are considered incapacitated for their particular occupation if their remaining working capacity for their occupation has been estimated below one-half. Apart from the cases of severe disabilitating somatic diseases the reasons for the increasing number of applications for pensions paid by the above mentioned institutions were manifold: there were numerous neurotics with difficulties in adjusting themselves to occupational, family, sexual and marital life as well as to the general changes which had taken place through politics and war: they formed the bulk of applicants. Other patients and factors were married women with difficult household duties, averse to the idea to continue or to return to their jobs; difficulties in finding or returning to a job after prolonged sick leave because of poor conditions on the labour market; reluctance of employers to accept elderly people; comparatively unimportant differences between salaries and pensions; finally dishonest reasons and malingering. The examinees belong to all age classes below 65 years for men and 60 for women, the age when working people are entitled to old age pensions.

Among several thousands of applicants referred for neurological and psychiatric examination by specialists of all branches, there were very few cases of pure malingering without any underlying overt psychological diseases. The bulk of examinees were neurotics with various neurotic symptoms or psychosomatic disorders, many of them showing the tendency to exaggerate the severity of their conditions. There were 3 employees and 22 manual workers showing syndromes corresponding to Ganser's states and presenting the four general features postulated by Skottowe (1953) and quoted by Goldin and Macdonald; I will repeat them for the significance I would like to attribute them: (1) the symptoms are an imperfect representation of the condition they resemble, (2) the symptoms correspond to the mental image that the patient might be expected to have of the illness or emotional state or role in life which is resembled, (3) the immediate syndrome, or the long-term general attitude and behaviour of the patient, can be seen to serve some gainful purpose for him, (4) careful history taking will generally show a previous clearly hysterical attack, though not necessarily in the same form, and hysterical traits of personality.

The patients were men, there were no women in this series. I have not seen any female patients presenting similar syndromes. Female examinees usually showed manifold hysterical symptoms and psychosomatic disorders, and exaggerated their complaints.

They were between 50 and 65 years of age. Some of them had applied for disability pension because they had lost their jobs for economic reasons (unemployment, etc.), prolonged health impairment of difficulties with employers or with their environment; the employment office had shown them the difficulties of finding suitable jobs for them at their age and in many cases some doctors, especially the medical officers of the employment office, had declared them partially or completely disabled.

Without any exception, these patients presented histories of previous and present neurotic disorders of different types, especially anxiety states and neurasthenic syndromes. No history or signs of chronic alcoholism could be elicited.

There were no single men among the examinees. All of them were either married or widowed, the latter living with their daughter or unmarried sisters. In three instances I examined the patients in their homes because they had been reported as not being fit to be brought to the clinic. The other patients attended the clinic accompanied by their wives or female relatives (daughters or sisters), in two instances by elderly unmarried male friends. The attending relatives were all over-solicitous and helped them not only with formalities, but with undressing and dressing; they behaved much more in a parental manner than as attendants of sick persons, trying to answer questions for the examinees, interfering with the examination and showing an adverse, in some cases hostile, attitude towards the examiner. None of the patients came to the appointments by himself.

In the receptionist's office and in the waiting room the patients show a strange, conspicuous behaviour. Some of them stayed there motionless and apparently not interested in the surroundings, not responding to the call of their names. Others took part in the usual waiting room conversations emphasizing the severity of their illness. Sometimes patients showing both types of behaviour had hysterical seizures while waiting for their examination. Some of the patients showed conspicuous signs of forgetfulness, leaving open the doors through which they had passed, leaving hats, umbrellas, etc. behind them, coming out of the lavatory with their trousers unbuttoned, asking repeatedly for the location of the lavatory, for the date, for the doctor's name and so on.

At interview they seemed depressed to a certain extent, but tried to appear indifferent and helpless, turning to their attendants for help when addressed for questions or orders. The attendants usually left the office reluctantly, some of them under protest when asked to leave the patient alone with the examiner and the nurse-typist. After they left the office, the patient usually showed a more helpless behaviour for a short time, but after a while it was possible to establish a much better contact with him, finally leading him to give up his helpless behaviour and in some instances even his Vorbeireden and to undress and dress without support. The phenomenon of Vorbeireden was typical and alternated with an astonishing correct answer after a few ridiculous wrong answers, or, more often, answers pretty close to correct ones. The wrong answers referred much more frequently to questions on general knowledge, everyday life events and recent matters than to questions regarding the patient's past and remote events, these being answered correctly in most cases. Delusions and hallucinations were denied, but all these patients pitied themselves and complained of being a burden to their families and an object of pity or mockery on the part of neighbours or friends.

The attitude and behaviour of the patients' attendants usually gave most

revealing hints for understanding the condition. As mentioned before, they appeared over-solicitous, over-protective and convinced of the seriousness of the condition. They gave a history of progressive neurotic behaviour starting after an important event in the patients' emotional life (illness or operation, death of relatives, loss of employment, financial or legal stress, etc.). Depression, anxiety, conversional symptoms, irritability, forgetfulness, in some instances seclusiveness and hopelessness were the usual symptoms listed by the attendants. However, when confronted with the Vorbeireden and the exaggerated childish behaviour of the patients, some of the attendants appeared honestly struck, astonished and ashamed. In those instances where the attendants showed a more or less indifferent attitude, it turned out that they had seen this kind of response before, e.g. when they had accompanied the patients to doctors' or lawyers' offices, to police, court, etc. As a matter of fact, in these cases the files contained records of similar behaviour on previous occasions, some of the patients having been diagnosed as Ganser states by other psychiatrists.

Physical examination usually did not reveal signs of gross pathology. In some cases there was slight hypertension and changes of the age. Neurological examination showed some signs of hyper-excitability of the vegetative nervous system and emotional tension of muscles as well as brisk reflexes.

In all these cases a psychological investigation comprising both intelligence tests and projective techniques, was performed by the psychologist, Dr. Th. Kohlmann of the Vienna University Psychiatric-Neurologic Clinic (Professor Hans Hoff). Without any exception, the reports showed findings of psychological disturbances in the sense of anxiety and hysteria, without serious difficulties in thinking processes or considerable withdrawal from reality. Various degrees of memory impairment did not exceed to a considerable degree the average impairment of elderly persons. In all but two cases there were more or less obvious signs indicating deliberately incorrect responses (malingering).

Treatment

In the case described by Goldin and Macdonald, three E.C.T.s were of obvious benefit. E.C.T. has proved beneficial not only in cases where depression was a prominent feature, but also for breaking the Ganser state as such. Usually a short course of treatment (three seizures) will suffice. In some cases prolonged sleep proves beneficial. However, the most important part of the treatment consists in a proper attitude of the physician and the environment. The best attitude is not to repeat more than necessary those questions calling for the symptom of Vorbeireden. Instead, it is much better to overlook the wrong answers, not to show one's indignation and to maintain a friendly and firm attitude without becoming too authoritarian. The same attitude has to be advised to the environment (nurses, officials, etc.). As to the patients' relatives and friends, the best policy is to explain to them in simple words the nature of the psychological disorder without stressing too much the malingering, and to ask for their co-operation first of all by not being over-solicitous, then by trying to help the patient to return to a normal adult life.

Discussion

My observations show many similarities to the case described by Goldin and Macdonald. They concern a group of ageing men with histories suggesting

neurotic disorders, being under great stress of social and financial nature, or being involved in legal affairs which they do not feel able to face. The only escape from these apparently unsurmountable difficulties for these characterologically weak individuals seems to be a significant regression. The resultant clinical picture is rather complicated, consisting of depressive and hysterical features attributable to unconscious processes, and malingering which by definition is due to conscious and wilful lying and presentation of non-existent diseases. However, in these cases it is felt that there is no sharp delimitation between unconscious and conscious mental processes; the defence mechanism of regression uses all means at its disposal, unconscious and conscious, hence the variegated picture of intermingled hysterical and malingering features. In this respect, I would not accept the formulation presented by Goldin and Macdonald that the Ganser state "may be regarded as in a position intermediate between malingering and hysterical states of more unconscious motivation". This borderland or no-mans' land cannot be seen in the cases under discussion, but the features are intermingled, as I tried to point out.

As to the differential diagnosis, I would like to emphasize the caution presented by Mayer-Gross, Slater and Roth with regard to the Ganser states with much abnormality of conduct. These authors report that "many of these patients have been found subsequently to be epileptic, or the subjects of an unsuspected schizophrenia or organic cerebral disease". As far as possible these possibilities have been ruled out by both auxiliary investigations (EEG, psychological testing) and follow up. The psychological findings matched the clinical picture and supported the diagnosis.

Summary

Presentation of a series of cases of Ganser state showing common features: ageing male patients with neurotic disorders, being under the care of over-solicitous relatives, breaking down in situations of unusual stress of social, financial and psychological nature. They present a clinical picture of mild depression with hysterical symptoms and malingering without distinct delimitation between these manifestations of regression. The therapeutic possibilities are discussed as well as the psychopathology and symptomatology of the Ganser state, especially the leading symptom of "Vorbeireden".

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THE CEPHALIC POST-TRAUMATIC SYNDROME. PATHOLOGICAL OBSERVATIONS*

By

ADAMS A. McCONNELL, M.A., M.Ch., F.R.C.S.I.

Richmond Hospital, Dublin

Regius Professor of Surgery, University of Dublin

I WANT to thank you, Mr. President, and the members of this Society for the privilege of appearing before you.

You are all familiar with the fact that headache, dizziness and mental disturbance occasionally persist for a long time after closed head injuries. These symptoms are usually grouped together under the title, "Post-concussional Syndrome". The question whether or not there is an organic lesion at the root of this syndrome has engaged many minds for many moons. I think the majority of observers would agree with the text which I have taken for this discourse. You will find it in the tenth chapter of the last book of Mayer-Gross, Slater and Roth, page 408. There it is written, "Although predisposition and psychological factors would appear to play a predominant role in its causation, the probability is that some degree of organic change plays its part in most cases."

I want to discuss the site and nature of the organic change postulated in this statement. It is generally taken for granted that if there is an organic lesion it must lie *in* the brain. Denny-Brown (1945) for instance, speaks of "the post-traumatic cerebral syndrome". Guttmann (1946) refers to "hypothetical structural changes" in the brain, while the authors of our text think of some "subtle structural alteration" in the brain. The very word, "post-concussional", implies a cerebral site.

Now there are four facts which suggest that wherever the lesion lies it does not lie *in* the brain: (1) in the majority of cases neurological signs, as distinct from symptoms, are absent, (2) headache, a predominant symptom in this syndrome, is not a symptom of structural damage in the brain; the brain is insensitive, (3) electroencephalography and the most intense neurological investigations have failed to reveal any intrinsic cerebral lesion, and (4) the most significant, the syndrome may occur in patients after a trivial head injury unaccompanied by concussion or suggestion thereof. That is why I've dropped the epithet, "Post-concussional" and adopted the wider one, "Cephalic".

As the search for a purely cerebral lesion has failed, it seems reasonable to consider the possibility of some other intracranial lesion. After all, the brain is not the only thing inside the skull, the only vulnerable occupant. Many years ago I learned that air encephalography and burr-hole exploration yield information about the intracranial state *otherwise unobtainable*, so I used these procedures in cases of the post-traumatic syndrome.

The results of burr-hole exploration are shown in Table I.

A diffuse accumulation of fluid or blood between the skull and the brain is the outstanding feature.

The most common finding was an accumulation of fluid in the subdural

* Paper read at the One Hundred and Fourteenth Annual Meeting of the Royal Medico-Psychological Association, Dublin, July, 1955.

TABLE I

Subdural effusion	96
Fluid subdural haematoma	4
External hydrocephalus	4
Swollen brain	3
No abnormality found	5
	112

space—a subdural effusion. As this condition is not widely recognized and has not been credited with symptoms of its own, it is necessary to say something

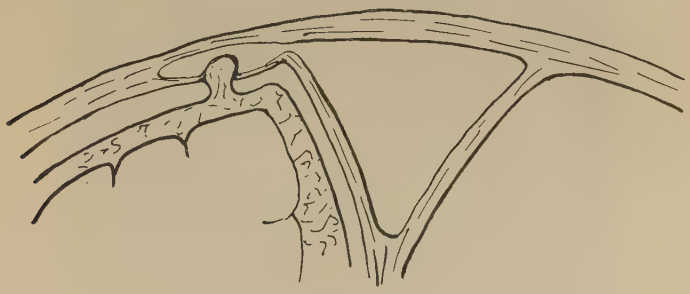

FIG. 1

about it. O'Connell (1953) has given the most satisfying explanation of its origin. Fig. 1 shows diagrammatically the relationships of the subdural and the

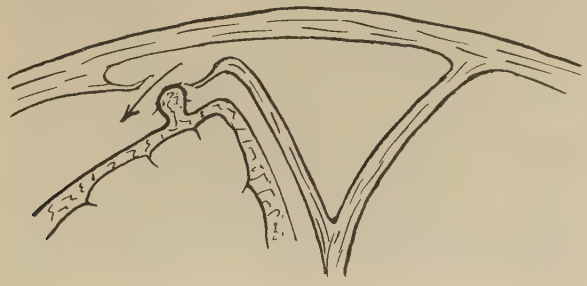

FIG. 2

subarachnoid spaces in the region of the sagittal sinus and the lacunae of that sinus. The arachnoid villi project into the venous channels.

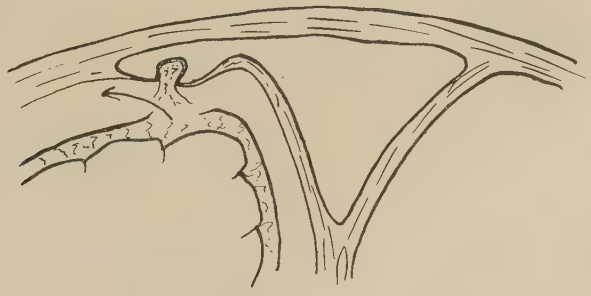

FIG. 3

During any abrupt or forcible movement the dura moves with the skull and the arachnoid moves with the brain. The resulting strain may tear a villus

out of a lacuna, blood then escapes into the subdural space. The blood clots and the classical subdural haematoma is born.

It is equally possible that the arachnoid villus should be torn at its root

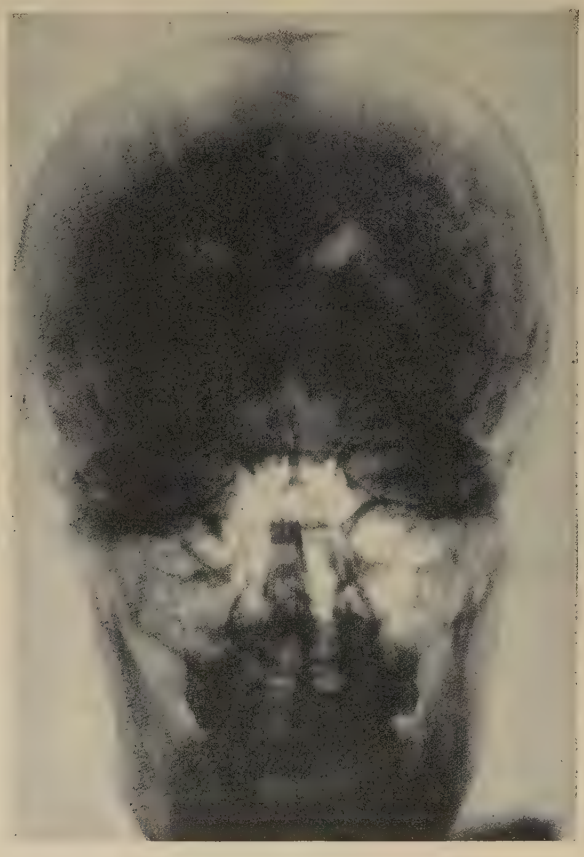

FIG. 4

and a hole left in the arachnoid membrane. This opening allows cerebrospinal fluid to pass into the subdural space—a subdural effusion.

In many cases holes are torn both in the sinus and in the arachnoid at the same time, and the result is a collection of C.S.F. heavily or lightly charged with blood. This is usually described, inaccurately, as a "fluid subdural haematoma" and is much more common than the pure haematoma which clots. Blood in the subdural space, whether pure or mixed with cerebrospinal fluid, indicates an expanding lesion. The pure subdural effusion does not appear to increase in volume with time. It is notorious that these subdural collections of blood, fluid or both can result from trivial injuries.

The hole in the arachnoid membrane which permits the escape of cerebrospinal fluid into the subdural space also permits the passage of air into that space when air encephalography is performed (Fig. 3).

Fig. 4 shows the distribution of air in the subarachnoid spaces and the ventricles immediately after its injection. Fig. 5 taken *twenty-four hours after the injection* shows that the air has passed through the hole and is lying in the

subdural space where it reveals a fluid level. If this second-day picture is not taken air encephalography is misleading, inconclusive and harmful. The results of air encephalography in 65 cases are set out in Table II.

FIG. 5

TABLE II

Pneumoencephalography

No. of Cases	Normal	Subdural Air
65	13	52

Burr-hole Exploration when Subdural Air Present

Subdural effusion	47
No effusion found	5

That the subdural effusion is not related in any way to air injections is shown by the fact that effusions were found long before encephalography was used. In the present series half the patients with verified effusions had burr-hole exploration without preliminary encephalography.

In Table III the protein content of the subdural effusion is compared with that of the cerebrospinal fluid in six representative cases.

TABLE III

Protein Content mg. per 100 c.c.

Case	Spinal C.S.F.	Subdural Fluid
1	30	280
2	40	720
3	40	170
4	30	400
5	30	2,200
6	35	5,000

The pathological conditions found in these cases had nothing to do with the patient's pre-traumatic personality, they were found in all sorts of people; in well-adjusted individuals without a care in the world, in the neurotic and in those predisposed to mental illness. Their occurrence had nothing to do with economic, social, or legal embarrassments. Trauma is no respecter of persons.

The mental disturbances in this series of cases so closely resemble those described in every text-book of neurology and psychiatry that it is unnecessary to mention them in detail. In general, each patient reacted to his symptoms according to his personality. The normally integrated individual was often able to carry his additional load, to put up with his disabilities and go on with his work. Sometimes, however, he tended to avoid social contacts and became morose, rude or irritable. In the maladjusted individual the maladjustment was increased; he tended to make the worst of everything and so added to, exaggerated or distorted his symptoms that their real nature was obscured. Anxiety about recovery, employment or compensation, coloured the symptoms in patients of every type.

Removal of the fluid removed the symptoms in 14 out of 21 compensation cases, and in 76 out of 83 of the other cases. In 15 cases fluid collected again and was removed.

CONCLUSION

Our authors postulated "some degree of organic change" as a factor in the causation of the post-traumatic syndrome. Here it is, the subdural effusion.

The simplest way to present the mental symptoms of a *chronic* subdural effusion is to say that they are exactly the same as those of a *chronic* subdural haematoma, with one notable exception; there is no clouding of consciousness. It is well known that a subdural haematoma can produce mental symptoms of any degree; sometimes mild, sometimes suggestive of dementia or cerebral arteriosclerosis. So can a subdural effusion. The haematoma, however, is a progressive lesion with progressive symptoms, however slowly they progress. The effusion is, for all practical purposes, a stationary lesion. If the patient with an effusion were worse he would be better off; if he developed clouding of consciousness someone would open his skull to look for a haematoma. As it is, the symptoms of an effusion are not recognized for what they are. Frustration and hope deferred add their own symptoms and these the psychiatrist tries to treat; he but blows away the smoke and leaves the smouldering fire.

My interpretation of the whole matter is this: the post-traumatic syndrome is compounded of the symptoms of a subdural effusion and the patient's psychological reaction to those symptoms.

The demonstration of a definite pathological condition brings the post-traumatic syndrome into the category of organic syndromes. It becomes an

integral part of the general neurological tapestry, not a separate piece of embroidery.

In one of his Essays Montaigne remarks, "Nothing can be revealed to him who in some sense knew it not before". The authors of my text use two words which indicate their foreknowledge. The words are, "appear" and "probability". "Although predisposition and psychological factors would *appear* to play a predominant role in its causation, the *probability* is that some degree of organic change plays its part in most cases". Perhaps in the second edition of their book these words will be in italics. I couldn't agree more.

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A LOGICAL AND CULTURAL ANALYSIS OF HALLUCINATORY SENSE-EXPERIENCE*

By

J. R. SMYTHIES, M.A., M.D., M.Sc., D.P.M.†

From the Department of Neurological Research, University of British Columbia, Vancouver, B.C., Canada

My purpose in this paper is to analyse the attitudes of people toward their own hallucinations and the attitudes of other people toward people who have hallucinations in our own and other cultures. It will, however, be helpful first to present a phenomenological classification of hallucinations.

1. A Classification of Hallucinatory Sense-experience

Hallucinations, considered as natural phenomena, may be divided into two great classes‡. *All* visual hallucinations are coloured and spatial (entities) and furthermore possess, to a greater or lesser degree, *internal organization.* That is, they possess a more or less complicated spatial structure: each part of the hallucinated object bears complex spatial relations to the other parts of the object. Hallucinations may, however, be divided into two classes on the basis of their degree of *external organization*, that is to the extent to which they are integrated into the veridical remainder of the visual field in which they occur. We can ask, "How are these hallucinations related to the visual objects of veridical (ordinary) sense-perception obtainable during the same specious present?" I propose to call these two classes, (i) *integrated*, and (ii) *non-integrated* hallucinations, in which the third group of *mechanical* hallucinations forms a sub-class.

(i) In the class of integrated hallucinations we find certain trivial hallucinations that occur from time to time in apparently normal people: for examples see Jephson (1932), Sidgwick *et al.* (1894) and Gurney *et al.* (1886). A small object may be seen, or objects heard, under the influence of powerful suggestion, when subsequent investigation shows that no such material object could have been present. Such hallucinations can easily be induced by hypnosis in susceptible subjects. Also in this class are more complex hallucinations which also occur in normal people. Prominent among these are so-called "apparitions"—hallucinations of people commonly occurring during some crisis in the life of the person seen. An extensive report of these cases is given by Tyrrell (1953) and in the publications of Sidgwick, Meyers, Gurney, Podmore and their co-workers (1886, 1894) and see Lambert and Guy (1952). Similar hallucinations can also be induced by hypnosis (see Fletcher (1949)). Now the point about this type of hallucination is that the hallucinated object or person purports to be a physical object—i.e. it looks and behaves very like a physical object or person. An "apparition" usually looks solid, throws a proper shadow, get smaller as it moves away from the observer, moves around the room with respect to the furniture, gets dimmer as it moves into the more dimly lit parts of the room, may speak to the observer or even touch him. In nearly one-half

* This paper is based on a paper read to the Social Science Club, University of British Columbia.

† Present address: Psychological Laboratory, Downing Street, Cambridge.

‡ I will concern myself, for the purposes of this paper, with visual hallucinations.

of the reported cases the "apparition" has been seen by more than one observer at the same time—i.e. there are collective hallucinations. These features of this class of hallucinations may be summarized by stating that the internal and external organization of the hallucination *approaches* that of veridical perception. An "apparition" may be so "life-like" as to be frequently confused with the biological person it purports to be. They frequently satisfy the criteria by which we judge what is and what is not a veridical perception and are accepted as members of the class of veridical perceptions—at any rate for a time—although this membership is usually cancelled by a subsequent experience, as when the apparition suddenly disappears or information is later obtained that the person hallucinated was actually at that time in a distant part of the country. We can discount the suggestion that these reports have been influenced by suggestion as to what a "ghost" should look like, for the reports are really quite unlike the folk or popular ideas of ghosts, which are commonly thought to be connected with specific places (rather than specific people), and to be sheeted figures that "squeak and gibber", or to be semi-transparent, given to eccentric behaviour, festooned with chains, etc. How far the literary and popular idea of "apparitions" differs from the actual reports of observers may be noted by consulting the original reports given above.

(ii) Now the characteristics of the second main class of hallucinations are that their internal organization is more complex and interesting than those of the first class, and they never resemble any veridical perception to the extent that they could ever be mistaken for a veridical perception. The characteristic feature of the first class is that they are *integrated* into the veridical remainder of the visual field in which they occur, whereas the members of the second class are not so integrated. They are commonly seen with the eyes shut and disappear when the eyes are open or at best form a faint background to the veridical visual field. Sometimes, in extreme cases, the veridical visual field itself is *replaced* by hallucinatory sense-data. Or it is so greatly changed that we can no longer regard it as a veridical visual field. Amongst this class are hypnagogic hallucinations, the mescaline phenomena and certain hallucinations of schizophrenics and mystics.

These two classes correspond to what have been called previously hallucinations and pseudo-hallucinations. These have been differentiated either on the grounds that in a case of pseudo-hallucination the person realizes that it has no "external foundation" (Henderson and Gillespie, 1951,) but mistakes a real hallucination for a physical object; or that the hallucination is fully externalized or "projected" whereas a pseudo-hallucination is not "projected". However, we can here suggest: (i) it is better to classify hallucinations on a basis of what we can actually observe as to their characteristics and relations rather than on the conceptual attitudes of people toward them, i.e. on whether they do or do not confuse them with physical objects, (ii) the concept of "projection" is based on an epistemological muddle (Smythies, 1954) and cannot be used in any scientific scheme. This concept is derived in any case from the observed facts that some hallucinations are integrated into the veridical remainder of the visual field in which they occur and that some are not, and thus it is better to use the observed facts as criteria for our classification than mistaken conceptualizations arising out of these facts.

The interesting feature of the internal organization of non-integrated hallucinations of class ii is that some of them have been reported to be much more beautiful than anything we normally see. Their form, colour and arrangement have an aesthetic merit and poetical integrity as has been claimed by

numerous observers to be far superior to any veridical perception, including that of any work of art. As Critchley has said (1931) "The usual emotional content of the hallucinations is best described as one of amazement, awe, interest, and delight. The character of the visions is such as to impress the most prosaic and unimaginative scientific observer in a manner of which no natural beauty is capable. Almost all writers have insisted that the most skilful pen or brush could not do justice to the marvel of the hallucinations".

A third major group of hallucinations are those occurring in all manner of diseases of and interferences with the nervous system—i.e. in epilepsy, cerebral tumour, cortical electrical stimulation, migraine, etc. These can usually be classified into one of our first two classes or may form a sub-class of the second group of abstract or *mechanical hallucinations* produced by interference with the visual mechanism; examples are the zig-zag fortification spectra of migraine, the hallucinations produced by stimulating the visual cortex (area 17) and the sort of picture that one sees on pressing one's eyeball with a finger.

2. The Attitude of People Toward Their Own Hallucinations in Different Cultures

Now if we consider the attitude of people toward their own hallucinations this will depend partly on the particular nature of the hallucination and partly on cultural factors. In many cultures in which people believe in the existence in another or supernatural world, hallucinations are taken to be direct visitations from this spirit world. Many of the techniques used, for example, by the Plains Indians on the vision quest are such as might be expected to induce hallucinations physiologically—e.g. starvation, prolonged torture, use of peyote, etc. In these cultures the hallucinatory experience is of value, often of supreme value, because it is taken to be a direct means of communication with the important spirit world. And the spirit world is held to be important both because it is thought to bear causal relations with this world, and because people after death are supposed to enter this other world.

Now the effect to which the hallucination will influence the person will depend to some extent on its immediate emotional, dramatic and aesthetic impact. One can understand that people might show no tendency to accept the zig-zag fortification spectra of migraine (class ii*a* hallucinations) as a communication from the spirit world. On the other hand hallucinations of class ii by their very nature would be liable to produce powerful emotional and conceptual responses in people who have them (cf. Critchley's account (1931) of the usual emotional response to the hallucinations induced by mescaline in experimental subjects. It would be safe to assume that these responses would be at least as powerful amongst (scientifically) naïve people.). Instances of this that could be given are the conversion of Saul following a peculiarly dramatic epileptic aura, Mohammed's vision of the angel, and, to give an example from a "primitive" culture, the conversion of Crashing Thunder (Radin, 1920). This Winnebago Indian was raised in the traditional culture of the Plains Indian in which the all-important event of life was an hallucination, obtained by special techniques (starvation, torture, etc.) in late boyhood. From this vision, it was believed, stemmed all of a man's subsequent power, luck and prowess in battle. Crashing Thunder failed to achieve an hallucination during the ritual four days' period of fasting but, in an understandable desire to obtain its social benefits, proceeded to invent one. Possessing a sceptical turn of mind he was unimpressed with his later initiation into the secrets of the Medicine Dance—the important religious ceremony of the Winnebago—and decided that what he had been led

to believe to be real magic was nothing more than conjuring and deceit. In disgust he ceased to practise the traditional religion of his group and soon entered into the typical alcoholic and sexually promiscuous decline of the Indian during the great period of acculturation. After some years as a chronic alcoholic he received an invitation to attend one of the ceremonies of the newly established peyote cult from his parents who were already members of the cult. He attended several meetings but only, as he later explained, out of curiosity and in order to please his parents. He failed to achieve any hallucinations, remaining sceptical of the whole business until, at the fourth or fifth ceremony, he hallucinated a magnificent eagle and later an equally magnificent lion. "It was as beautiful a sight as one could behold. 'This is what it is,' I thought. 'This is what they all probably see and I am just beginning to find out.'" From this moment stems his religious conversion. He gave up alcohol and tobacco, married a good girl and settled down to be an exemplary citizen.

Many similar instances of the remarkable variety and impact of class ii hallucinations have been given by William James (1902).

The individual's response to his own hallucinations in our culture will be determined largely by fear of ridicule or madness (due to the popular belief that hallucinations are symptoms of insanity) and the fear and anxiety generated by any sudden and inexplicable happening (because our culture does not give any acceptable *explanation* of hallucinations). It will also depend upon the type and frequency of the hallucinations and upon the individual's social setting, cultural subgroup, previous history, religious beliefs, etc. In general we can say that, in our culture, hallucinations are scarcely ever sought or gloried in when occurring.

3. The Cultural Response Towards People who have Hallucinations

As might be expected, in most cultures which regard hallucinatory sense-experience as a means of communication with the supernatural world people who have hallucinations tend to be regarded as especially favoured by the gods, and they are thus accorded respect and esteem or awe and dread by their fellow men; or they are thought to be attacked by evil powers and thus to be in need of support, sympathy and defence. The dominant part played by hallucinatory sense-experience amongst the Plains Indians has been mentioned above. In other cultures, such as the Eskimo and certain Siberian tribes, people who have hallucinations become Shamans—the religious leaders of society.

In our culture there has been a marked change in the attitude toward hallucinations and people who have them. In the Middle Ages hallucinations formed an accepted means of communication with the supernatural world as the writings of many mystics demonstrate. People who had them were generally admired and received approval from ecclesiastical authority, but only, it may be noted, for so long as the hallucinations were of a form that could be interpreted as communions with that part of the supernatural world regarded as heavenly and not that part regarded as devilish. An example of a change of attitude in this respect is that of the ecclesiastical authorities toward the voices of Joan of Arc.

Following the change in emphasis in our culture from *other-worldly* to *this-worldly* the general acceptance of the belief in the existence of a supernatural world at first decayed into a pre-occupation with witchcraft and then was given up and was regarded as "superstition". As a consequence of this, hallucinatory sense-experience lost its warrant of validity, for it could no longer be regarded as a means of communication with a real world, and the cultural

attitude towards people having hallucinations became cooler. In general, those cases of hallucinatory sense-experience that do not exceed certain limits do not evoke any great cultural disapproval. For instance, isolated cases of hallucinations of class i can generally be accepted as instances of "seeing a ghost" and I think it is true, at least in England, that seeing a ghost is not taken as evidence of social aberration. Secondly, people who have hallucinations in a situation where some causal factor can easily be isolated, i.e. in toxic deliria or delirium tremens incur no great cultural disapproval. An alcoholic may meet with disapproval on account of his antisocial behaviour but an attack of delirium tremens does not add to this disapproval to any great extent. Likewise hypnagogic hallucinations are quite respectable forms of hallucinations.

It is only where the person has too many hallucinations; or insists on interpreting his experience in terms of communion with "another world"; or of giving them some other positive *value judgment*; or if he behaves in a manner dictated by these emotional and conceptual reactions to his experience so as to conflict with culturally determined notions for proper behaviour, that conflict is liable to arise between the individual and society. A person who engages in biologically useless religious symbolic behaviour to the exclusion of "normal" biological behaviour in response to the demands of his hallucinatory experience (interpreted as "visions of God", etc.) is labelled schizophrenic and is segregated. This is not to suggest that this is the form of all types of schizophrenia but merely of certain well-defined syndromes that fall into this group.

There are, of course, certain sub-cultures within our culture in which hallucinatory experience is acceptable and even desirable. Certain religious sects, the spiritualist and theosophist movements, etc. provide organizations in which certain people liable to hallucinations can find a measure of cultural support.

Now as regards the official and semi-official "scientific" explanations of hallucinatory experience, we can find a marked contrast between the Freudian view with its entirely this-worldly outlook and the Jungian view with its somewhat other-worldly outlook. In psychoanalysis the hallucinations have no independent reality value or any value at all except as *signs* from which the nature of the causative disorder may be discovered by the analyst and thus appropriate therapy instituted. Whereas in analytical psychology the archetypal images are regarded as being psychological realities in their own right, and the whole aim of Jungian psychotherapy is to enable the individual to reach a harmonious state of adjustment with this world *and* with another world—the Collective Unconscious—although the other-worldly nature of the Collective Unconscious is somewhat disguised by a complex terminology.

Thus in Freudian psychology a person has only to adapt to his this-worldly environment (including his social and cultural environment). The persecution suffered by the paranoic is thus not a *real* danger to be faced nor are the hallucinations of the schizophrenic *real* scenes witnessed—i.e. parts of the Platonic archetypal world—but they are supposed to have an autogenous origin in the complex physiological mechanism of the organism analysed in the analogical terms, "projection", "repression", "super ego", etc. of Freudian psychology. Nevertheless the hallucinations are *accepted* by the analyst with sympathy and understanding. In Jungian psychology those dangers faced by the psychotic subject are as real* as any biological danger —e.g. a hungry tiger—for they derive from a real other-worldly cause—the Collective Unconscious—which is a mental world of some kind distinct from

* That is they derive from causes outside the personal unconscious of the person concerned.

the physical world. Thus the Jungian attitude is akin to that found amongst many other cultures, for instance, the Guatemala Indians where the hallucinations are regarded as being real entities (i.e. in the example given by Paul (1952)—they were thought to be the real spirits of dead people) and the threat to the person is a real threat—not only to herself but to the whole community—to be met by the support of the whole community who show the hallucinated person sympathy and assistance: relatives and neighbours are expected to be in constant protective attendance. One can argue that this approach toward the mentally ill is liable to have superior therapeutic results to the dislike, rejection and isolation, commonly experienced by the mentally ill in our own society. In Guatemala the occurrence of hallucinations provides a key to enable the mentally sick person to re-enter his own society, whereas in our society the occurrence of hallucinations provides a powerful lever to eject the person even further out of our society—with the further catastrophic effect on the progression of his illness due to the resultant secondary guilt.

Now it might be argued by an apologist for our traditional way of dealing with hallucinated people that the Guatemalan method for dealing with them may very well be therapeutically superior to our own way; but, unfortunately, he might continue, we cannot bring ourselves to adopt a similar attitude because we *know* that hallucinations are not real, and thus we simply cannot destroy our intellectual integrity by taking up deluded attitudes however beneficial to the sick person they might be. For we should all be entering upon a multiple case of *folie à deux* if we were to do so. If we should ask just how it is that we *know* the hallucinations are unreal the apologist would answer that science had found this out. To this we can reply that the decision as to what is real is not the sort of decision that could be reached by the methods of science. These decisions are made in light of our basic assumptions about nature—the basic limiting principles upon which science is itself based—and depend upon decisions taken by scientists as to what is the proper sort of thing to study by scientific methods and by philosophers engaged in ontological analysis. Now, if we say that science is concerned in finding *predictable order* in the complex patterns of our sensory experience (Dingle, 1937) and that only that is real which is studied by science, then we have no logical grounds for stating that hallucinations are not real, for they are certainly part of the complex pattern of sensory experience, and their order has been studied by many neurologists and psychologists. If, on the other hand, we define the universe of discourse of science as the "real world" in the sense of the world of physical objects, the psychologist can object that his researches into eidetic, hypnagogic, and mescaline-induced hallucinations is every bit as scientific as any part of physics itself, and that no one has as yet produced any remotely plausible theory as to exactly how hallucinations are related to brain events and thus how they can logically be reduced to brain events.

Thus it can be argued that the basic decision to call hallucinations "real" or "unreal" is a matter of convention and is determined by the rules in our language relating to the use of the word "real" and is thus a matter of culture. Therefore it would merely be a case of entirely indefensible ethnocentricity to claim that *we* were right in this respect and that most other cultures wrong. Thus we can claim that any particular hallucinations are psychologically and ontologically real (not, of course, biologically or physically real) in the sense that, for example, a particular unicorn is unreal. That is, the statement "There are no unicorns" is true whereas the statement "There are no hallucinations" is false.

In conclusion the main problem posed by hallucinatory sense-experiences of class ii may be stated as follows:

In what sense may hallucinations be said to be real?

I have sketched an outline to a reply to this exceedingly complex problem with its epistemological, psychological, neurological, cultural and sociological facets. At present most people would regard hallucinations as entirely "unreal", and it could be argued that a part of the future progress of schizophrenia as a disease process depends on a change of this attitude, for the nature of the clinical picture of schizophrenia depends to a large extent upon the cultural attitude to the disease and this in turn depends partly upon the cultural attitude toward the reality, or unreality, of hallucinatory sense-experience. Thus the psychiatrist must continue to emphasize that to be mad is, in general, not to "lose one's reason" but it is to be plunged into another order of experience in which, amongst other factors, the terrifying reality of hallucinations makes normal sociological behaviour impossible.

Summary

This paper presents a phenomenological classification of hallucinations and analyses the emotional and conceptual reaction to these classes of hallucinatory sense-experience in the case of people in our own and other cultures. In general it can be said that in many (so-called "primitive") cultures hallucinations are regarded as *real* and people who have them are regarded as having real experiences and are accorded respect and deference, or sympathy and assistance, according to the circumstances. In our own culture people who have hallucinations, outside certain definite limits laid down by the culture, are regarded as being aberrant, mentally sick, "insane". A brief enquiry into the logical and scientific basis for this attitude is then made. The conclusion is drawn that we have no valid logical or empirical reason for supposing that hallucinations are not real and the suggestion is made that a change in the present attitude of our culture in this direction would be of therapeutic benefit to schizophrenics.

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CEREBRAL CYSTICERCOSIS WITH MENTAL SYMPTOMS

By

J. M. SUTHERLAND, M.D., M.R.C.P.E.
Senior Medical Registrar
Aberdeen Royal Infirmary

and

J. M. ROSIE, M.D., D.P.M.
Deputy Physician Superintendent
Craig Dunain, Inverness

MANY current textbooks fail to place sufficient emphasis on the occurrence of psychological symptoms in cysticercosis. The case reported gives point to the contention of Bickerstaff (1955) that clinical manifestations other than epileptic convulsions are not widely recognized.

CASE REPORT

A man now aged 42 was in good health until February, 1945 when, after six months' service with the Army in India, he developed pains in the chest and back for which no physical cause could be found. His complaints continued and in December, 1945 he was referred to a psychiatrist who found him to be suffering from an anxiety state and recommended invaliding to the United Kingdom. There was no previous personal history of nervous disorder and his family history was also negative in this respect. While returning home by troopship in March, 1946 there was a transient phase of disturbed behaviour and the patient was described as aggressive, obstinate and hypochondriacal. On landing he was again seen by a psychiatrist who made a diagnosis of anxiety state with somatic dysfunction. After his discharge from the Army and his marriage in 1946 his mental state deteriorated. He refused to work, complained of pains in various parts of his body and developed delusions of persecution with a religious colouring. His behaviour was at times menacing and in 1947 he first began to have ill-defined seizures which, in retrospect, were probably psychomotor epileptic attacks. He left his wife in July, 1947.

From 1948 to 1954 the patient was under the care of several specialists in both general and mental hospitals. At first no evidence of organic disease was found but in 1949 subcutaneous nodules on the limbs and trunk were observed. Their significance was not appreciated until the following year when biopsy revealed cysticercosis. Meantime psychiatric features had developed to the point where they were described as "a textbook picture of chronic schizophrenia". Speech was slow and deliberate, delivery pompous and accompanied by grimacing. The patient demonstrated passivity feelings and delusions of persecution and grandeur. Auditory hallucinations were denied. In his behaviour he was generally idle, withdrawn and unobtrusive with rare phases of acute excitement. He continued to complain of intermittent pains, flashes of light and transient amnesia. Major epileptic seizures occurred infrequently. In 1951 his epilepsy was ascribed to cerebral cysticercosis but the infestation was not held responsible for his mental state.

In 1955 the patient was re-admitted to Craig Dunain Hospital with a history of more frequent epileptic fits. Both grand mal and Jacksonian seizures occurred and the latter were sometimes marked by postictal paresis of the right leg. Psychiatric symptoms were less florid than hitherto but the patient could be led to admit that he possessed supernatural powers and had an important role to play in human affairs. Physical examination revealed palpable cysts on the shoulders and thighs and minimal clinical evidence of a left-sided cortical lesion. Examination of the blood and cerebrospinal fluid furnished no abnormal findings and a comprehensive radiological search failed to demonstrate any calcified cysticerci. An EEG tracing showed an epileptogenic focus in the left frontal region. An ECG was normal. No segments or ova were recovered from the stools despite two treatments by filix mas and mepacrine.

COMMENT

We feel that few would doubt the validity of the diagnosis of cerebral cysticercosis and most clinicians would refer the epileptic seizures to this con-

dition. The absence of calcified cysts is not unusual (Dixon and Hargreaves, 1944; MacArthur, 1950). In view of this, and since the presence of palpable cysts in muscle or subcutaneous tissue is not a constant feature, one can visualize instances in which the diagnosis can only be reached after an adequate assessment of clinical evidence. We would also suggest that there are no sound reasons for rejecting the assumption that the patient's schizophreniform illness is also referable to cerebral cysticercosis. Dixon and Hargreaves (1944) point out that alteration in personality and disorders of behaviour may occur in cysticercosis with or without major or minor epileptic attacks and state "the possibility of cysticercosis should be considered before a soldier who develops such symptoms after service in India is invalided on purely psychiatric grounds". Ten of their cases had previously been diagnosed as suffering from various psychiatric disorders including one case "characterized by a schizoid personality". According to MacArthur (1950) diagnoses made in cases which later proved to be cysticercosis have included hysteria, neurasthenia, melancholia, acute mania, delusional insanity and dementia praecox. These gross disturbances have not always been accompanied by fits.

Bickerstaff (1955) has drawn attention to the fact that in cerebral cysticercosis there is a constant periarteritis and endarteritis of both meningeal and smaller cerebral vessels, and suggests that these changes may play a part in the production of mental and neurological symptoms. Such a view finds a ready parallel in cerebral syphilis and it is therefore of interest that Williams (1948) reported a case of cerebral cysticercosis with epilepsy, slurring speech and mental changes which had previously been diagnosed as suffering from cerebral syphilis. No one would care to dissociate the epileptic fits of general paresis from the mental symptoms of that disease. It seems illogical to do so in cerebral cysticercosis.

Although we do not consider that cysticercosis is a common cause of mental illness in this country we feel it should be considered in patients who have previously lived in India, Poland, Portugal, Southern Italy or South America. Failure to do so may result in the correct diagnosis being missed and a purely psychiatric one with its attendant social implications being made. The above account would indicate that this may occasionally occur.

Acknowledgments

We would like to thank Dr. M. M. Whittet, Physician Superintendent, Craig Dunain Hospital, for permission to report this case.

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THE NEUROPSYCHIATRIC ASPECTS OF FAMILIAL DYSAUTONOMIA (THE RILEY-DAY SYNDROME)

By

WILLIAM FORSTER, M.B., B.S., D.P.M.
Clinical Director
and
MILO TYNDEL, M.D., Ph.D.(Vienna)
Neuropsychiatrist
The Hospital for Mental Diseases, Brandon, Manitoba

Introduction

Familial dysautonomia, first described as a distinct entity in 1949 (Riley *et al.*, 1949), is considered to be a comparatively rare disease, only some 48 cases being so far recorded (Riley *et al.*, 1954). But as its features become more widely known it is likely to be increasingly recognized. It occurs in children of Jewish parentage, the majority of cases being reported from the U.S.A., with one from South America (Tyndel, 1955), and some from Montreal (Riley, 1955).

The constant symptoms comprise: defective lachrymation ("crying without tears"); symmetrical, blotchy erythema following emotional disturbances or eating; excessive sweating; sialorrhoea; emotional lability; poor motor co-ordination; relative indifference to pain; and hypo- or areflexia. *Inconstant symptoms* are: intermittent hypertension; periodic vomiting which may threaten life; liability to respiratory diseases; frequent unexplained bouts of pyrexia; attacks of apnoea during the first year of life; corneal ulceration; orthopaedic changes (scoliosis, pes cavus); and epileptiform convulsions (Riley, 1952).

The condition is familial, apparently being inherited as a simple recessive trait (Riley *et al.*, 1954), though an irregular dominant is a possibility (St. Martin, 1953).

Neurologically (Riley *et al.*, 1954) the most frequent findings are: defective lachrymation (100 per cent. of cases), absent corneal reflexes; skin blotching and absent or inconstant deep tendon reflexes. About half the cases show a positive Romberg, dysaesthesia and weak dorsiflexion of the foot.

Psychiatrically the patients over-react to emotional stimuli, have a short attention-span, are restless and distractible and are liable to explosive outbursts. In Gestalt perception they are below average. In formal intelligence testing the results are often uneven, and the low average scores produced are at variance with the clinical impression of the child's intelligence.

The behaviour disturbance reacts on the parents, who in turn react on the child. The result is a vicious circle, producing an unstable, insecure home which exacerbates the child's disordered behaviour.

Treatment of the total disorder by neurosurgery (Bridges *et al.*, 1949) or drugs has proved ineffective, though chlorpromazine has been useful in the vomiting attacks (Riley *et al.*, 1954). The most useful approach to the overall management of the case has been the psychological handling of the parents and environment (Tyndel, 1955; Riley *et al.*, 1954).

Case Report

The patient is a 6-year-old boy of pure Jewish ancestry referred to the child-guidance clinic because of disturbed behaviour. He was said to be restless, distractible, negativistic and recalcitrant to all discipline. Spanking was liable to bring on a breath-holding attack culminating in a convulsion.

The family history was completely negative for dysautonomia. Both parents were born in North America, but the grandparents came from eastern Europe. The paternal grandfather and grandmother originated in Roumania and Bessarabia respectively, the maternal in Galicia and Russia.

He was born after a 40 hours labour and weighed 7 lb. 1½ oz. During the first four months he had frequent vomiting, attributed to incorrect formula. From the fourth month he became liable to pyrexial "throat infections", the liability lasting until the age of two.

He was weaned at 1 year without difficulty, but was slow in walking and talking. He took his first step at 15 months but remained poorly co-ordinated and until 4 years old would fall very easily. He did not talk until he was two.

There were no episodes of cyclical vomiting but from the time he began to get around he was liable to monthly attacks of mild diarrhoea.

In general he was a "very good but very active" baby. Change in disposition occurred after an attack of pneumonia at 18 months. This triggered off two typical grand mal convulsions, and since then he has had a combination of attacks consisting of a jerk and brief eye-rolling and breath-holding convulsions. With regard to the latter the mother states: "He starts to cry . . . but he can't. After a while his throat seems to close up and he goes stiff and unconscious but does not twitch." He receives phenobarbitone and milontin. Previous investigations by EEG and ventriculogram had been negative.

He has never cried with tears, has always shown excessive sweating, and drools constantly. From the age of 18 months any scratch has been liable to go septic; but on the other hand he has diminished pain sensation, especially of the cornea. He does not notice grit in the eye and did not bother to mention a recent, accidental avulsion of a finger-nail to his parents. He blotches with large erythematous areas on body, neck and cheeks when upset. Bladder control was defective up to the age of 4 years and he still has occasional nocturnal enuresis.

Psychiatric examination (W.F.) shows a distractible, emotionally labile child, swinging from whining to laughter. He refuses to be separated from his parents for more than a few moments, and his demanding attitude towards them is most apparent. Phantasy plays a much larger part in his life than is usual even with children of his age: he has imaginary playmates, and at times is actually hallucinated. On one occasion he dashed out of the clinic play-room after a "big dark man", then rationalized his inability to find the man by saying he had "gone into a house". On another occasion he ran out after a non-existent dog, and on yet another because his friend was being killed outside.

When he cries, as he frequently does, it is hard to tell whether he is laughing or crying . .. on several occasions he switched spontaneously from one to the other.

His phantasy is coloured by his projected aggression. He is afraid of strange children, is terrified if a toy gun is pointed at him, and will not watch scenes of violence on the cinema or T.V. Sometimes it expresses his ambivalence towards his younger brother in a more or less direct manner.

The leading features of his behaviour, apart from the above, are his mischievous lack of co-operation and negativism. His poor co-ordination is very evident.

Psychometric examination. The clinic psychologist (Mr. Neil Hildebrand, B.A.) reported: "Bender Gestalt shows marked cortical defect . . . gestalt functions are at a maturational level below 3 years. The intelligence tests administered (W.I.S.C., Arthur Point Scale and Stanford-Binet) rate him a mental age of 4 years 6 months and an I.Q. within the dull normal range. Test behaviour shows marked distractibility, low frustration tolerance and lack of confidence. Although curious and interested his attention span is short. He does better on verbal items than on visual-motor. On the basis of verbal items a mental age of 5 years, corresponding to an I.Q. of 87, would appear to be maximum."

Neurological examination (M.T.) showed a thin boy with definitely dolichocephalic skull (cephalic index below 75), without skeletal deformities. There was no tenderness of skull or cranial nerves to percussion or palpation. Eye movements were free and full; pupils reacted normally to L and C; no nystagmus present. *Corneal* reflexes were absent. Muscle tone of extremities was normal. *Biceps, triceps and supinator jerks could not be elicited.* Abdominal reflexes were diminished. *A.J.'s and K.J.'s were absent. Bilateral Babinski response was elicited. Pain sensation was diminished.* (Poor co-operation prohibited testing of epicritic sensation.) *The gait was unsteady and broad-based, with a tendency to fall on reversing.* Patient could not walk slowly but tended to run. There was poor co-ordination of movements of the lower extremities.

Physical investigations: Blood count and urinalysis negative. Blood group O, Rh. negative. Plain skull X-rays were normal.

The major EEG abnormality was the presence of paroxysmal spike and slow wave forms, consistent with a condition producing paroxysmal disturbances of behaviour or consciousness.

Parental Attitudes

Our observations in this case fully bear out the findings reported by Riley, Freedman and Langford (Riley *et al.*, 1954).

In our case the father was reasonably stable in his attitude to the boy, although very permissive. He could handle him much more easily than could the mother, although he generally resorted to bribery to persuade the child.

Consequent upon his convulsions the parents decided to give him his own way in everything, so that he was not disciplined until recently. Now his mother is driven by an almost frantic urge to make him "grow up a normal person" and is attempting to impose discipline in the wrong places without being consistent or attempting to avoid conflict with him over unimportant matters. She argues about the advice which is given her to insist only on important points in disciplining him; e.g. to insist on a certain standard of cleanliness but not to expect a prompt reply when she calls him for his meals. (To this she replies that normal children come when called, and he must be like them.) She almost invariably loses the disciplinary battle. The result is a more or less constant conflict between the child and herself, with marked guilt-feelings on her side. Her attitude suggests a mixture of inability to accept the child as he is, rejection, guilt and over-compensation. For his part, the child expresses his negativism mainly towards his mother.

Discussion

The syndrome is essentially based on deranged central nervous system functioning with consequent emotional disturbance, and secondary psychological features from disturbed interpersonal relationships.

An anatomical origin in the diencephalon has been suggested, but the most difficult feature to interpret from a neurophysiological aspect is the diminished lachrymation, for increased lachrymation usually accompanies disturbances in this region (Riley *et al.*, 1949).

We have not come across any published hypothesis correlating the physical features and a possible locus in the central nervous system. In the absence of conclusive autopsy findings any suggested anatomical localization must be hypothetical. However, in familial dysautonomia we have disturbances of reflexes, sensation, co-ordination and bladder control. In our case there were also pyramidal signs. Along with these go disturbances of consciousness, of the vegetative nervous system, and of emotional control. It seems probable to us that all this complex of symptoms could be explained on a basis of anatomical or physiological changes in the brain-stem reticular system. For the reticular system interacts with the specific functional systems of the central nervous system at different levels . . . subthalamic, intrathalamic, cortical and cortico-thalamic. The whole complicated system and its connections cannot be discussed here, but is well described by Penfield and Jasper (1954).

Both the case described here and that described previously by one of us (Tyndel, 1955) showed a peculiar shape of the skull, both children being decidedly dolichocephalic. Further investigations in this respect would be of interest. In both cases, also, while the parents were born in Continental America the grandparents originated in eastern Europe. Genealogical studies might therefore prove of value.

Treatment in the case described included anticonvulsants, chlorpromazine and reserpine. No drug was effective, and if anything reserpine made the behaviour worse. In our present state of knowledge, psychotherapeutic guidance of the parents and alteration of the child's environment, as suggested by Tyndel, has offered the most useful approach. One of the most useful measures in this respect is to provide relief for the parents by having someone of a calm disposition take over the care of the child at intervals.

Summary

1. A case of familial dysautonomia in a 6-year-old Jewish boy is described.
2. An anatomical or physiological disturbance in the brain-stem reticular system is hypothesized to explain the symptoms and signs.

3. Further investigation of this, of the geographical origin of the family, and of skull type is suggested.

4. In the case reported, the drug therapy with anticonvulsants, chlorpromazine and reserpine proved ineffective to control aberrant behaviour. The psychotherapeutic handling of the parent-child relationships was of more value.

Acknowledgments

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MENTAL ILLNESS AND SOCIAL CONDITIONS IN BRISTOL

By

E. H. HARE, M.D., D.P.M.

Consultant Psychiatrist
Warlingham Park Hospital, Surrey

Late Senior Medical Officer
Barrow Hospital, Bristol

In a pioneer work, Faris and Dunham (1939) studied the distribution of mental disorders in Chicago. Essentially their findings were that the incidence of schizophrenic cases was highest in the central areas of low social and economic status and lowest in the affluent residential districts on the periphery; that the differential distribution of cases of senile and arteriosclerotic dementia was similar to but less marked than that of schizophrenia; but that cases of manic-depressive psychosis were much more evenly distributed throughout the city though with a tendency to higher rates in better-class areas. They concluded that "social isolation"—the fact that in the central area of the city a person tended to be cut off from intimate and lasting emotional relations with other people—was a causal element in schizophrenia and that this accounted for the observed difference of incidence. Their findings have been confirmed in nine other American cities (Clark, 1949) but there have hitherto been no reports of similar studies outside the United States. The aim of the present study was to test, in an English city, the observations of Faris and Dunham on the urban distribution of mental disorders, and, by relating the distribution to various indices of social and economic status, to determine whether any additional evidence could be found for the hypothesis that social isolation is a factor in causing schizophrenia.

Method

Bristol is the eighth largest city in England and has a population of nearly half a million. For administrative purposes it is divided into 28 wards which may be used as units to study the variations of case rates and social levels in the city. Details of the method are given below.

Definition of a case. For the purposes of this study, a "case" of mental illness was defined as "the first admission of a patient from a private address within the city of Bristol to a mental hospital". The term "mental hospital" was used to cover any hospital or nursing home accepting only or mainly patients with mental illness. The "private address" was the address from which the patient was admitted to hospital; patients of no fixed abode or who were admitted from hostels or institutions where they had been for more than a month were excluded. Allocation of home addresses to the appropriate ward was rendered easy and reliable by the use of a code kindly supplied by the Electoral Registration Officer.

The difficulties involved in the definition of a case and the question whether admission to a mental hospital is a satisfactory criterion of mental illness have been discussed at length by the Millbank Memorial Fund (1953) and succinctly by Dunham (1953).

Case finding. The cases studied were those admitted to hospital during a five-year period, 1949–53. This period was convenient because it yielded sufficient cases to allow reasonably reliable incidence rates to be calculated, because the psychiatric facilities in Bristol remained fairly constant during the time and because it was centred on the 1951 Census. Most of the psychiatric cases in Bristol are admitted to the Bristol Mental Hospitals, but every effort was made to trace patients treated elsewhere. The kind co-operation of the Bristol psychiatrists practising privately and of the Medical Superintendents of nine private mental hospitals enabled this to be done, and, although it is not possible to determine the completeness of the private case finding, I believe that the 35 male and 91 female cases represent the great majority. Altogether 1,264 male and 2,040 female cases were found.

Diagnosis. The difficulties involved in psychiatric diagnosis are well known, but because for the most part the cases were diagnosed by the staff of a single hospital with frequent opportunity for the interchange of clinical opinion, it seems fair to suppose a reasonable consistency of diagnosis among the physicians. Each case was allocated to one of five diagnostic groups:

(1) Schizophrenia (including schizo-affective reactions, paranoid states and paraphrenia);

(2) Manic-depressive psychosis (including involutional depression, atypical depression, depression in the senium and depression "other and unspecified");

(3) Neurosis (including reactive depression and hysteria);

(4) Senile dementia (including arteriosclerotic dementia); and

(5) Other diagnoses (including psychopathic personality, alcoholism and epileptic disorders).

The total cases in each of these groups was 472, 1,052, 961, 341 and 478, respectively.

Social and economic indices. Information obtainable from the 1951 Census and from the Local Authorities enabled various indices to be calculated for each ward, reflecting aspects of the social and economic status of the ward. Of eight such indices, three were selected which showed the smallest degree of intercorrelation and which might thus be taken as measuring the most different aspects of the environmental conditions. These three indices are now considered in more detail.

The proportion of single-person households (i.e. of people living alone) in each ward was obtained from special census data on a 10 per cent. sample of the 1951 Census returns for Bristol. This proportion varies from under 4 per cent. (of the total households) in Ward 15 (where most of the population live in a Council housing estate) to nearly 30 per cent. in Ward 6 (a good-class residential area).

The mean rateable value (for residential houses, flats and rooms) for each ward was obtained from figures supplied by the City Rating Department. This value varied from £11·1 in Ward 21 (in the poor central area) to £40·7 in Ward 8 (the most favoured residential area in the city.)

In calculating population density as persons per acre, the ward population figures were obtained from the Census Report (1953), but, as the wards contain varying amounts of parkland and open space, the figure used for the ward area was that of the "nett residential area" as determined by a survey carried out by the City Engineer's Department between July, 1949 and September, 1950. The ward population density so obtained varied from 24 persons per acre in Ward 8 to 126 persons per acre in Ward 22 (the central business area).

Social homogeneity of the wards. In any investigation which attempts to relate the distribution of a disorder to social factors, the choice of geographical units is of primary importance. In the present study, however, the choice was limited by the necessity of having readily accessible social and demographic data for the units and in practice this left the city wards as the only possible units.* Nevertheless, because of variations in size of the wards and, in some instances, a marked lack of social homogeneity, their use for this purpose is somewhat unsatisfactory. In an attempt to meet this difficulty case rates have been compared in three larger areas of the city, as described in the next section.

Results

Distribution of Mental Disorder in the City Wards. Fig. 1 shows the city wards shaded according to various levels of the standardized inception ratio†

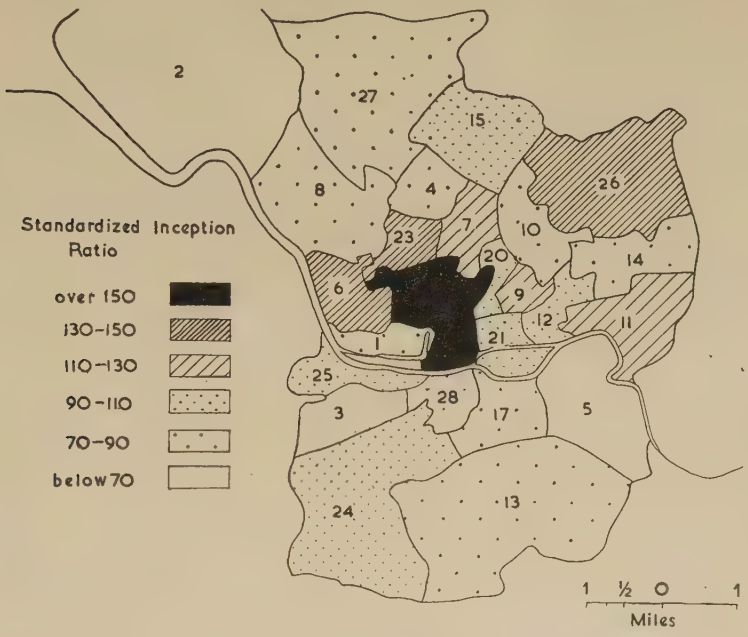

Fig. 1.—Rates for schizophrenia in the wards of Bristol.

for schizophrenia. The wards with highest ratios (150 and over) are all clustered together in the city centre. Fig. 2 shows the corresponding map for manic-depressive psychosis, which evidently has a much more even distribution throughout the city. A χ^2 test shows that the observed distribution of schizophrenia among the wards is unlikely to be due to chance ($\chi^2 = 52{\cdot}6$, $P<0{\cdot}01$), while that of the other diagnostic categories does not depart significantly from random.

Correlation between ward inception rates and social indices. Table I shows the coefficients obtained when the standardized inception ratios for the wards are correlated with each of three social indices. The degree of correlation is in

* It was unfortunate that in no case did the census enumeration districts correspond either with the sub-wards or with the "neighbourhood areas" as delineated by the City Planning Department.

† The "standardized inception ratio" is the ratio expressed as a percentage of the observed to the expected number of cases in a ward and is proportional to the inception rate. The expected numbers of cases are corrected for differences in age and sex distribution of the ward populations. For the use of the term "inception", see Registrar-General (1954).

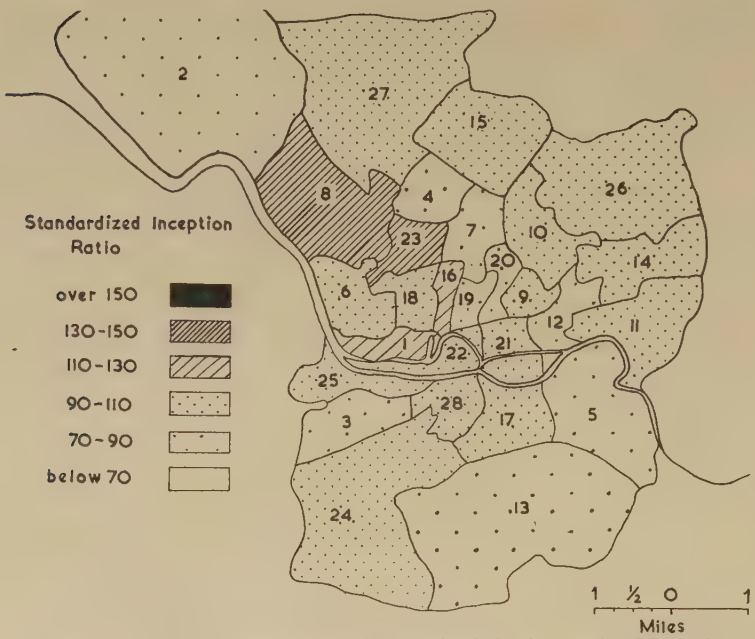

FIG. 2.—Rates for manic-depressive psychosis in the wards of Bristol.

TABLE I

Correlation Coefficients Between Standardized Inception Ratios and Social Indices for the 28 Wards of Bristol

	Proportion of Single-person Households	Mean Rateable Value	Population Density
Schizophrenia	0·63*	0·27	0·37
Manic-depressive psychosis	0·33	0·60*	−0·07
Neurosis	−0·02	0·50†	−0·39
Senile dementia	0·06	0·09	0·03
All diagnoses	0·55†	0·54†	0·19

* Probability less than 0·001.
† Probability less than 0·01.

several instances unlikely to be due to chance and the results suggest (*a*) that there is little or no association between mental illness and population density, (*b*) that high schizophrenia rates are associated with a high proportion of single-person households, (*c*) that high rates for manic-depressive psychosis and for neurosis tend to be associated with high mean rateable values, and (*d*) that senile dementia shows no association with any of the three social indices. The relation between schizophrenia rates and the proportion of single-person households is show in the dot-diagram (Fig. 3).

Consideration of three groups of wards. From a general knowledge of Bristol, three socially distinct areas may be delimited. These are the "good central area" of better class houses, mainly residential, occupying the high ground on Clifton and Durdham Downs; the "poor central area" occupying the low-lying region on the north bank of the Avon; and the "housing estates", the planned corporation-owned estates built mostly within the past 30 years, which surround the central older part of the city. As representative of these three areas, three groups of five wards have been studied; they are referred to

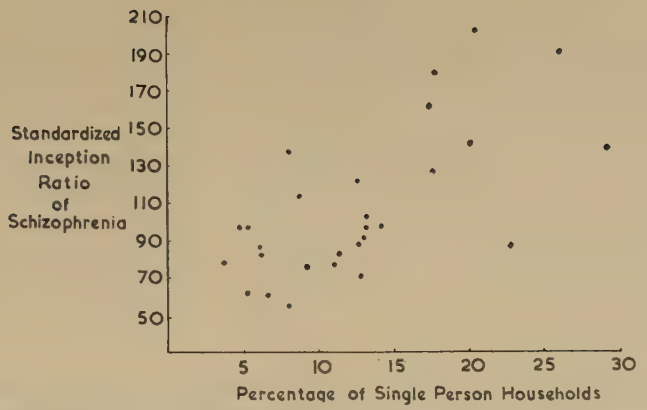

FIG. 3.—Relation between schizophrenia rates and proportion of single-person households, by wards.

as Groups A, B and C*. These groups were selected on the criteria (*a*) that four wards notably heterogeneous as regards social characteristics were excluded and (*b*) that of the remaining wards Group A contained those of highest mean rateable value, Group B contained those of lowest mean rateable value and Group C those with the highest proportion of council houses.

Table II shows the social indices and the population data for the three ward groups and for the city as a whole. It is evident that the populations in these groups are widely divergent in social and economic level.

TABLE II

Social Characteristics of Three Groups of Wards and of the City

Index	Ward Groups A Good Central	B Poor Central	C Peripheral	City
Mean rateable value (£)	32·1	12·8	17·2	19·5
Single-person households, percentage of all households ..	20·0	14·0	5·0	11·3
Population density (persons per acre)	41·5	103·7	42·2	49·9
Corporation-owned houses, percentage of all houses	2·0	3·5	49·9	21·3
Population, as percentage of the city population	14·2	11·3	26·6	100·0

Table III shows the observed and expected numbers of cases of different diagnoses in the three ward groups. There is an excess of schizophrenia cases in both central areas and a marked deficiency in the peripheral areas. This distribution, which is unlikely to be due to chance ($\chi^2 = 15{\cdot}6$, $P < 0{\cdot}01$), is similar to the distribution of single-person households but does not correspond with that of mean rateable value or of population density. Further, the schizophrenic cases in the two central areas show a sex difference not shown in other diagnostic groups: in the good central area male schizophrenics are no commoner than expected but female schizophrenics are in very significant excess (59 cases as

* Group A was comprised of Wards 4, 6, 8, 18 and 23; Group B of Wards 9, 19, 20, 21 and 22; and Group C of Wards 2, 5, 13, 14 and 15.

TABLE III

Observed and (in Brackets) Expected Numbers of Cases in Three Groups of Wards, by Diagnosis

Diagnosis	Ward Groups A Good Central	B Poor Central	C Peripheral
Schizophrenia	86 (67·2)	66 (54·5)	94 (125·6)
Manic-depressive psychosis	207 (176·4)	119 (126·0)	221 (245·8)
Neurosis	160 (142·9)	90 (110·7)	260 (251·8)
Senile dementia	70 (76·1)	41 (44·1)	61 (59·1)
All diagnoses	622 (533·4)	391 (392·5)	730 (805·6)

against an expected 40·6), while in the poor central area the opposite is true (41 male schizophrenics as against an expected 25·3). This sex difference may be compared with a corresponding sex difference in the numbers of people living alone; in the good central area, only 18 per cent. of persons living alone were male, but in the poor central area the figure was 29 per cent. (city average 24 per cent.).

An excess of manic-depressive and neurotic cases occurs in the good central area, but this might well be due to chance. It is clear that the distribution of senile dementia does not differ appreciably from random.

DISCUSSION

The results for the distribution of schizophrenia and manic-depressive psychosis broadly confirm those of Faris and Dunham. There are, however, certain differences in the distribution of schizophrenic cases. Thus while, as in Faris and Dunham's study, the central area of the city showed a high rate of schizophrenia, this high rate occurred both in the poor central area (i.e. of low mean rateable value) and in the good central area. The social factor common to both these areas was not high population density but a high proportion of persons living alone. Again, the peripheral areas of the city, where the schizophrenia rates were in general lowest, were not (as they were in Faris and Dunham's study) high-class residential areas but predominantly council housing estates, whose distinguishing social feature was not high mean rateable value but a low proportion of persons living alone. It is of interest that Sainsbury (1955) found a similar set of relations between social factors and suicide in London boroughs, viz. that suicide rates were closely associated with the proportion of persons living alone, but not with overcrowding or socio-economic status. The high schizophrenia rates for males in the poor central area is in line with the finding of an excess of male schizophrenics in the lower social classes of Bristol (Hare, 1955); but the fact that the highest rates for schizophrenia in females occurred in the good central area suggests that the social class distribution for females may be very different from that of males.

For the distribution of senile dementia the results are not in conformity with those of Faris and Dunham or of Gruenberg (1954). Gruenberg studied the inception rates of senile and arteriosclerotic dementia in Syracuse, New York State, and found that wards with high rates had a low socio-economic level. It is again of interest that the particular social index which showed the highest rank relation with the inception rates in Gruenberg's study was the proportion of people living alone.

If the results obtained are accepted as valid, the next step is to consider possible explanations to account for them. It is not hard to find reasons why the distribution of senile and arteriosclerotic dementia in Bristol should be different from that in American cities. The more even distribution of wealth and the facilities for free treatment under the National Health Service in Britain will tend to lessen the difference between rich and poor in their methods of seeking medical attention for permanently disabled relatives. As regards Gruenberg's finding of the association between senile dementia and the proportion of persons living alone, a recent study in Liverpool (1953) showed only a small degree of social isolation among old people; the same is probably true of Bristol.

There are various ways in which the non-random distribution of schizophrenia may be explained:

(*a*) Chance.
(*b*) An increased likelihood, in the central areas, of schizophrenic cases being referred to psychiatrists.
(*c*) Increased mobility of the population in the central areas so that there are, in effect, a greater proportion of unattached, vagrant persons exposed to risk in these areas.
(*d*) Segregation of schizoid personalities in the central areas.
(*e*) Certain social stresses acting as causal factors in the development of schizophrenia.

Each of these possibilities may be examined. We may reasonably dismiss chance as an explanation, not only because of its statistical improbability, but because the findings in Bristol are similar to those in several cities in the United States and because there have been no contradictory reports.

Variations in the local standard of what is considered abnormal is a hypothesis that has been advanced by Owen (1941) to account for some of the findings of Faris and Dunham in Chicago. But in Bristol it seems unlikely that a standard of behaviour which is considered abnormal both in the good and the poor central areas should not be so considered in the periphery; moreover, even if such variations existed, it is hard to see why they should apply to the behaviour of schizophrenics and not to that of other diagnostic categories—indeed, the contrary would seem more probable.

Although there are no recent statistics, a knowledge of Bristol does not suggest that there is any more movement of the population in the central areas of the city than in the periphery. Bristol has never suffered severely from industrial depression and has no "necrotic" or "hobo" centre such as has been described in Chicago during the nineteen-twenties (Zorbaugh, 1929). Its industries are so varied and well-balanced that Bristol has been called "the pattern of a diversely occupied town" (Little, 1954) and there seems to have been relatively little migration into or out of the city during the past ten years. No doubt there has been considerable internal mobility but much of it is due to the movement of families from the central area to the housing estates on the periphery. In a study of the residential histories of 80 patients (including 9 schizophrenics) consecutively admitted to the Bristol Mental Hospitals during 1955, 53 had been at their address for more than five years; during this period of time 12 had moved house either within the central or within the peripheral wards; 5 had moved from the periphery to the centre and 5 from the centre to the periphery; only 3 (including one schizophrenic) had, in the last five years, immigrated from outside the city to the central wards, while 2 (including one

schizophrenic) had immigrated to the peripheral wards. These figures suggest that immigrant patients form only a very small proportion of the total and that there is as much movement to the peripheral as to the central areas. Although, from the point of view of assessing the influence of the environment on mental disorders, the residential mobility of patients is an important factor (and one which has not been considered in the present study), yet the available evidence lends no support to the view that excessive mobility in the central areas can account for the higher rates of schizophrenia there.

The hypothesis of segregation, however, is sufficient to explain the observed differential incidence of schizophrenia. If persons of a solitary or suspicious nature tend to move to those areas of the city where single accommodation is most easily obtainable and where there is a relatively high degree of social anonymity (that is, in the lodging-house areas of the central wards) then individuals with vulnerable personalities will accumulate and so tend to increase the schizophrenia rates there. This idea of "segregation" is somewhat different from the hypothesis of "drift" which was put forward as an explanation of the Chicago findings. The drift hypothesis implied that schizoid individuals became increasingly incapable of keeping better paid employment and so gradually drifted into the poorest areas which, in Chicago, were the central areas of high population density. Hollingshead and Redlich (1954, 1955) and Hollingshead, Ellis and Kirby (1954), however, showed that schizophrenic patients of the middle classes tend before their illness to move upward rather than downward in the social scale. This work would seem to dispose of the hypothesis of drift in its original sense. "Segregation" is here used in the sense that persons who for various reasons wish to be free from the emotional ties of family life will tend to move to the lodging-house areas in either good or poor districts; it does not necessarily imply any loss of earning power. Unlike drift, segregation implies an active rather than a passive process.

The final possibility, that certain environmental factors are causal in schizophrenia, is the one favoured by Faris and Dunham (1939). They developed the hypothesis that schizophrenia tends to be precipitated by the effects of social isolation (Faris, 1934, 1938, 1944); the work of Hyde and Kingsley (1944) and of Jaco (1954) lends support to this, though that of Kohn and Clausen (1955) does not. It is evident that the results of the present study can be explained on these lines if (as is reasonable) we conceive of social isolation as a factor present in areas where there is a high proportion of persons living alone, irrespective of economic level or population density.

We may conclude that the results are explicable on either of two hypotheses—a segregation in certain areas of persons liable to schizophrenia or a causal effect of the environment in these areas. These two hypotheses are by no means incompatible and both factors may be operative. A study of the residential histories and of the personalities of schizophrenics from these areas might help to solve this problem.

SUMMARY

1. A study has been made of the distribution of 3,304 cases of mental disorder in Bristol. These were psychiatric cases admitted to mental hospitals or nursing homes during a five-year period, 1949–1953. The inception rate of different diagnostic categories in each of the city wards and in three groups of wards has been determined and correlated with three indices of social and economic level.

2. The distribution of schizophrenia departed very significantly from random, with high rates in the central wards. The distribution of manic-depressive psychosis, of neurosis and of senile dementia did not depart significantly from random.

There is a marked association between schizophrenia rates and the number of people living alone; high schizophrenia rates occurred in areas of both high and low population density and of high and low mean rateable value.

Rates for manic-depressive psychosis and for neurosis show a slight association with mean rateable value. Rates for senile dementia show no appreciable association with any of the three social indices.

3. The possible explanations of these results are considered and it is concluded that the observed distribution of schizophrenia can be explained by the hypothesis that there is a segregation in certain areas of persons liable to schizophrenia or by the hypothesis that social isolation is a causal factor.

Acknowledgments

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THE TREATMENT OF DEPRESSION WITH METHYLAMPHETAMINE

By

G. DE M. RUDOLF, M.R.C.P., D.P.M., D.P.H.

Consultant Psychiatrist

Hortham-Brentry Group and Mount Pleasant Nursing Home, Clevedon

In earlier articles from 1939, the results of treatment with amphetamine preparations have been discussed. In this paper, a comparison of the results of treatment by means of electric convulsive therapy with those from methylamphetamine will be made.

The methods of comparison used will be:

(1) Both methods used by the same physicians on different cases.
(2) The same cases treated by both methods, in different attacks.
(3) Types of depression treated by either method by numerous writers.

With the first method, diagnosis, and degree of depression and estimation of results will be fairly constant. With the second method, diagnosis of the type of depression is certain but estimation of degree and of results is less certain. With the third method, estimation of results and of degree of depression may vary from author to author but diagnosis of type of depression is certain as articles giving indefinite descriptions have not been used.

1. Comparison by Same Physicians

Comparisons of the two methods of treatment given by the same physicians have been published by Rudolf (1949) and by Monro and Conitzer (1950). The first reported that of cases of depression of all types outside mental hospitals and treated as out-patients or in-patients in a nursing home, 83·3 per cent. of 42 cases improved with oral methylamphetamine used up to three times before 1 p.m. and the same percentage improved of 30 cases treated with E.C.T. Monro and Conitzer (1950) reported an improvement-rate of 32·5 per cent. of 34 cases in a mental hospital treated with oral methylamphetamine used up to twice daily and 78·1 per cent. of 200 cases given E.C.T. These writers stated that with the first treatment, none showed marked improvement, 11·8 per cent. moderate improvement and 20·6 per cent. slight improvement. Of the series treated with E.C.T. 22·5 per cent. showed marked improvement, 55·6 per cent. moderate improvement and 10·0 per cent. slight improvement. Rudolf's similar results with both treatments were based on a series of cases probably containing less severe depressives than that of Monro and Conitzer. In addition, he used up to three doses of methylamphetamine daily, whereas Monro and Conitzer used only two. He used a maximum daily dosage varying from $1\frac{1}{4}$ mg. to 60 mg. (Rudolf, 1955b) Monro and Conitzer using up to 30 mg. daily. It is clear that the intensity of treatment given by these workers was less than that given by the present writer and that possibly his cases were, on the average, less severe than were their patients.

2. Comparison of Same Cases Treated by Both Methods

Elsewhere (Rudolf, 1955a) a summary has been given of 20 unselected cases each treated with E.C.T. or, by the author, with methylamphetamine in

different attacks of depression, totalling 58. Of 36 attacks treated with E.C.T. some improvement took place in 69·4 per cent. and of 22 attacks treated with methylamphetamine in 86·3 per cent. Much Improvement was seen in 32·1 per cent. of the attacks treated with E.C.T. and in 42·9 per cent. of those treated with methylamphetamine. Improvement took place in 35·7 per cent. and 42·9 per cent. respectively, and no improvement in 32·1 per cent. and 14·3 per cent. Some improvement was seen in different attacks with either E.C.T. or methylamphetamine in 14 cases, with E.C.T. but not with methylamphetamine in 1 case, with methylamphetamine but not with E.C.T. in 3 cases and with neither treatment in 2 cases. One case received 9 courses of treatment. In the first 3, he received 3, 4 and 4 electric shocks, showing Marked Improvement in the first and third attacks. He improved temporarily in the 4th attack with methylamphetamine, in the 5th attack markedly with 7 electric shocks, in the 6th with methylamphetamine, in the 7th with 7 electric shocks, in the 8th with methylamphetamine and in the 9th with 4 electric shocks. Other cases showed also that much improvement can occur with E.C.T. or methylamphetamine either before or following treatment of other attacks with the alternate method.

These cases were of the manic-depressive type and some improvement might have taken place if no treatment had been given, but as the improvements recorded occurred during the courses of treatment, only few would have been coincidental.

3. Comparison by Summation

Comparison can be made for all types of depression and for the same types separately, the cases being here grouped into the classes of depression described by Sargant and Slater (1951). The results can be divided into cases who were Much Improved, who were Improved and who showed no change.

As all authors do not give full details of diagnosis or results, the numbers in each series vary.

A. All Depressions

(*a*) Much Improved. Of 1,616 cases treated with E.C.T. and reported in 12 publications, 63·9 per cent. were much improved, whereas of 273 cases treated with methylamphetamine and reported in 3 articles, 33 per cent. were much improved.

(*b*) Improved. Of 1,321 cases treated with E.C.T. and reported in 8 papers, 30·4 per cent. were improved, but of 273 cases treated with methylamphetamine and reported in 3 articles, 43·6 per cent. were improved.

(*c*) Not Improved. Of 1,612 cases treated with E.C.T. and reported in 12 publications, 8·7 per cent. were unimproved but of 273 cases treated with methylamphetamine and reported in 3 papers, 23·4 per cent. were unimproved.

B. Involutional Depression

(*a*) Much Improved. Of 1,255 cases treated with E.C.T. and reported in 18 articles, 58·6 per cent. were in this class and of 33 treated with methylamphetamine only 30·3 per cent. from 1 article were much improved.

(*b*) Improved. From 11 papers, a total of 575 cases were collected, of whom 31·8 per cent. were improved by E.C.T. Of 33 from 1 article, treated with methylamphetamine, 60·6 per cent. fell into this class.

(*c*) Not Improved. From 14 articles, 1,030 gave 12 per cent. unimproved when treated with E.C.T., and of 33 cases from 1 article, 9·1 per cent. were unimproved when treated with methylamphetamine.

C. Manic-depression

(*a*) Much Improved. Of 938 cases, 57·1 per cent. showed much improvement with E.C.T. as reported in 9 articles, and 40·7 per cent. of 54 cases treated with methylamphetamine in 2 articles.

(*b*) Improved. The improved rates in 819 cases from 7 articles for E.C.T. were 35·3 per cent. and of 54 cases from 2 articles for methylamphetamine, 37 per cent.

(*c*) Not Improved. Of 893 cases from 8 articles, 9·9 per cent. were unimproved by E.C.T. and 22·2 per cent. by methylamphetamine of 54 cases from 2 articles.

D. Reactive Depression

(*a*) Much Improved. From 3 articles, 101 cases gave 34·7 per cent. much improvement with E.C.T., and from 2 articles, 45 cases gave 53·3 per cent. with methylamphetamine.

(*b*) Improved. In this class, the same 101 cases gave 43·6 per cent. with E.C.T. and the same 45 cases, 33·3 per cent. with methylamphetamine.

(*c*) Not Improved. Of 112 cases from 4 articles, 17·9 per cent. remained unimproved with E.C.T. and 13·3 per cent. of 45 cases from 2 articles with methylamphetamine.

E. Depression with Anxiety

(*a*) Much Improved. Of 56 cases from 3 articles 42·9 per cent. were much improved by E.C.T. and 33·3 per cent. of 39 cases from 1 article by methylamphetamine.

(*b*) Improved. Of the same cases, 50 per cent. were in the improved group after treatment with E.C.T. and 48·7 per cent after treatment with methylamphetamine.

(*c*) Not Improved. Of these cases, 19·7 per cent. showed no improvement with E.C.T. and 17·9 per cent. with methylamphetamine.

F. Depression with Hysteria

(*a*) Much Improved. From 2 articles, 60 cases gave 48·3 per cent. much improved with E.C.T. From 1 article, 42·9 per cent. of 28 cases were much improved with methylamphetamine.

(*b*) Improved. Of 29 cases treated with E.C.T. and reported by one writer, 31 per cent. were in this class but of 28 cases reported by another writer, and treated with methylamphetamine, 53·6 per cent were improved.

(*c*) Not Improved. Of 42 cases from 2 articles 21·4 per cent. showed no improvement with E.C.T., and of 28 cases, from 1 article, 3·6 per cent. were unimproved with methylamphetamine.

G. Depression in Oligophrenia

Of all types of depression in mental defectives of any grade, Much Improvement was reported in 29 per cent. of 14 cases from 1 article with E.C.T. and 21·1 per cent. of 19 cases from another article with methylamphetamine. The other two degrees of improvement were not reported for E.C.T.

Discussion

1. Two articles gave results of both treatments used on different cases by the same physicians. In one article the percentage of all degrees of improvement was the same for E.C.T. and methylamphetamine, in the other, where less of

the drug was used, the improvement rate was much higher with E.C.T. than with methylamphetamine.

2. Results of treatment of 20 cases who were treated with either E.C.T. or methylamphetamine in different attacks of depression showed that methylamphetamine gave the greatest total number of Much Improved results.

3. The study of summation of cases appears to show, on limited series, that patients who are Much Improved by treatment show a higher proportion with E.C.T. than with methylamphetamine amongst the involutional depressives, and the depressives with anxiety. The reactive depressives show a higher proportion of Much Improved cases with methylamphetamine than with E.C.T. and the depressives with hysteria show equality in the Much Improved group. The proportion of the Much Improved amongst manic-depressives is not clear.

The proportion of patients who did not improve were approximately similar with both treatments in the involutional, the reactive and the anxiety cases. A higher proportion of cases with hysteria showed no improvement with E.C.T. than with methylamphetamine, and the reverse held amongst the manic-depressives.

As a 3-point scale was used, the patients who were moderately or slightly improved were the remainder. The proportions of this group were greater amongst the involutional cases and the hysterical cases with methylamphetamine than with E.C.T., and somewhat greater amongst the reactive depressives with E.C.T. than with methylamphetamine. The manic-depressives and the depressives with anxiety showed equal proportions of this type of improvement with either treatment.

A decision regarding which treatment should be used must depend upon many factors. Wayne (1955) stresses the personality of the physician, pointing out that unconscious constellations may produce the decision to use E.C.T. In view of the great differences amongst therapists regarding the necessity for the use of E.C.T., the frequency and the total number of treatments, this writer believes that a more standardized practice may be developed if the physicians understand their own unconscious relationships with the method. Wayne gives, as examples, (*a*) deep-seated inadequacy resulting in a secret desire to eliminate sick people, (*b*) over-compensation for this inferiority with the need to impress colleagues, or to have apparent power of life or death over patients, (*c*) punishment of the patient for his failure to improve rapidly, (*d*) assaulting the patient to neutralize tension in the physician who may feel assaulted or disturbed by his own lack of understanding, (*e*) unresolved rivalry feelings towards fathers or brothers may lead to desire to annihilate patients thought of as rivals, (*f*) revenge towards older women for archaic frustration at the mother's breast, (*g*) proof of strong masculinity towards younger women, (*h*) anxiety about his own sexual and aggressive impulses so that the physician uses a treatment in which he can remain psychologically aloof or even can withhold it entirely.

On a conscious level, the more timid, the more humane and the less dramatic physicians will be likely to choose methylamphetamine. The less humane, the lover of the dramatic and the reckless may lean towards E.C.T. These conscious tendencies must be ignored, the timid must become courageous and the lover of the dramatic must forgo his love. But, at the same time, his underlying unconscious motivations must be understood by the physician who may have the duty of advising or giving E.C.T.

Providing the risk of suicide is negligible, the more prudent course would appear to be the administration of methylamphetamine in adequate dosage (Rudolf, 1955a) first, followed by E.C.T. if Much Improvement is not ob-

tained. Although the danger of death or injury is reduced by the use of relaxants and other additions to E.C.T., some risk to the patient still persists. Under careful observation during treatment with methylamphetamine, no risk occurs, as the dose can be reduced or stopped immediately any undesired side-effect occurs. Habituation can occur, but not if the therapist remains in entire control of the treatment. An objection to trial of methylamphetamine is that the patient may suffer from depression, with its consequences on relatives and friends, for a greater period than if E.C.T. had been used initially. In most cases, no permanent harm results from this prolongation of the depression, whereas the patient runs a risk of permanent damage from E.C.T., such as, for example, chronic pain from healed fractures.

Summary

1. Comparison was made according to types of depression of the results of treatment with E.C.T. and methylamphetamine.

2. Comparison was made with two groups of patients treated by the same physicians, of the same patients treated in different attacks with either method, and of the summed results published by numerous workers, both as regards mixed and separate types of depression.

3. With the first method, one publication reported similar percentages of improvements with either method. Another article gave considerably smaller proportions of improvements with methylamphetamine, the authors using a smaller dosage and probably, more severely affected cases. With the second method, a greater proportion of improvements took place with methylamphetamine than with E.C.T. With the third method, a higher proportion of Much Improved cases amongst all types of depression was found following E.C.T. than with methylamphetamine therapy. Of involutional depressions, and of depressions with anxiety, a higher proportion of Much Improved was reported with E.C.T. than with methylamphetamine. Cases of depression with hysteria showed no difference between the results of the two treatments. Cases of reactive depression gave a Much Improved rate greater with methylamphetamine than with E.C.T.

4. In view of the differing results of treatment and of the unconscious constellations and the conscious preferences of the physicians influencing the choice of treatment, the suggestion is advanced that the more prudent course, provided safeguards are adequate, is to treat the depression, first, with methylamphetamine and later with E.C.T. should the results not be sufficiently good with the first method.

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Reviews

Encyclopedie Medico-Chirurgicale. Editée sur Fascicules Mobiles. Psychiatrie. Publié sous la direction de Henri Ey. Secrétaire de Rédaction. H. Duchêne. Paris, 1955. Tomes 3. Pp. 1800.

An encyclopaedia produced in the country of Bayle, Diderot and d'Alembert is bound to recall a great tradition; whether it aims to be "universal" or to deal only with one branch of knowledge, it will be expected to show a logical order of presentation, as well as clarity, learning, and discriminating judgment. These expectations are largely fulfilled in the three massive volumes on Psychiatry now published under the editorship of Dr. Henri Ey. The sponsors of the work are the small but intellectually active group of psychiatrists responsible since 1929 for *l'Evolution Psychiatrique*, a valuable journal chiefly concerned with psychopathology and psychotherapy. Dr. Ey has given this compilation by many hands the stamp of his own scholarly mind. There are 146 contributors, and although some familiar and prominent names are missing, it is clear that Dr. Ey has cast his net wide and shrewdly.

After a masterly historical introduction by the Editor, Volume One begins with chapters on medical psychology, physiology, morbid anatomy and statistics. Seventeen chapters on symptomatology, and six on diagnostic methods are followed by detailed clinical descriptions of acute psychotic disorders and epilepsy. Then come mental defect and the chronic psychoses; the varieties of schizophrenia are dealt with under this head. Volume Two contains a lengthy section on the neuroses and psychopathic personality, psychological aspects of physical disease, cerebrogenic syndromes, and mental disorders due to toxic, infective and endocrine disease; a final section is devoted to heredity, constitutional types, and the influences of the environment. Volume Three opens with a section on social psychiatry, in which the relevant aspects of religious life, immigration and military service are reviewed, and the requirements for giving expert reports set out. A full section on treatment deals first with psychotherapeutic methods, including those appropriate to children and adolescents; physical methods—insulin, E.C.T., leucotomy, continuous sleep, and a number of pharmacological procedures—make up the body of the volume, and there is a concluding section on the background of psychiatric practice, such as social welfare and legislation, occupational therapy, and private practice. A separate brochure, "La psychiatrie dans le monde", provides brief statements about the general position of psychiatry in eleven European and two South American countries, the U.S.S.R., and the United States. In order that the work should not become out-of-date, it is bound on the loose-leaf system which will permit additions and substitutions. This convenient device makes consecutive pagination impossible, however, so that in the alphabetical index the way of indicating where a reference is to be found is slightly more cumbersome than usual.

No one can read through an encyclopaedia. Even the most conscientious reviewer must base his opinion of the work on samples and a general impression, fortified by his previous knowledge of the abilities and standing of the contributors. Inevitably the articles will be uneven, the matter not always to the liking of an individual reader, the distribution of space arguable. But it would be captious to find fault with a bold enterprise of this kind because it fails to meet ideal requirements. A comparison of the work with the last major production of the same kind—Bumke's *Handbuch der Geisteskrankheiten*—shows how the emphasis in psychiatry has shifted, and how differently the same matter can be regarded in different countries and after twenty years. It is not only because of the different outlook of the two editors that the relative importance of morbid anatomy and clinical detail on the one hand and of psychopathology and treatment on the other have been reversed.

French psychiatry has an honourable history, but it cannot be denied that for a considerable part of the nineteenth and the twentieth century it went its own way,

illuminating and original, but with small regard for what was being thought and done elsewhere. Probably that is why in England few were familiar with the achievements of French psychiatrists since Magnan. Self-sufficient insularity is no longer a characteristic of French psychiatric writings, as may be recognized in the well-informed, wide-ranging articles in this encyclopaedia: and the conjunction of classical French views with those more prevalent in the world in 1955 results in an informative and still distinctive presentation which it is most profitable to consult. There are moreover many recent developments in France which have been too little regarded abroad: they receive due attention here.

The volumes are a fine example of French book production, and an evidence of the vitality of French psychiatry.

AUBREY LEWIS.

The Psychology of The Criminal Act and Punishment. By GREGORY ZILBOORG, M.D. Harcourt-Brace and Co., New York; The Hogarth Press Ltd., London.

The problem of capital crime and the reactions provoked by it in individuals and representatives of society is for us, in the English speaking world, a gravely topical problem. Individual and social conscience is uneasy, and but for the fear that very serious consequences might follow the suspension of capital punishment, there seems little doubt that abolition of the death sentence would be a cause embraced by many who are now indecisive. It is also recognized that court-trial is far from infallible, and that the statutory enquiry acts to save many who otherwise would be a burden on the social conscience.

To this general topic Zilboorg makes a contribution in his book *The Psychology of The Criminal Act and Punishment*. His aim is to increase the general unease felt regarding the social and juridical response to capital crime, by discussing the plethora of personal (and juridically irrelevant though effective) unconscious factors, which become involved, not only in the crime, but also in the conduct of the Attorneys, the Judge and the Jury.

The Isaac Ray Memorial Lectures, the second series of which form this monograph, are intended to contribute to the greater understanding between the legal and medical professions of America. The method which seems to be adopted by Dr. Zilboorg is that of demonstrating the presence of personal, unconscious factors suffusing what is generally taken to be an objective and impersonal or non-subjective system of attitudes and conduct, and thus discrediting the objectivity of the legal procedure. A psycho-analytically interpretive approach is used, and the material to which it is applied is of interest. Much of this is historical in the sense that the quotations employed are some 100 years old and much of it is English. No personal case studies are offered, nor does Dr. Zilboorg at any time claim to speak from direct personal experience of the prosecuting or defending attorneys or of the opportunities this might have offered him of investigating or observing the personal factors in the professional performance. To the clinician the generalizations put forward by Dr. Zilboorg in regard to these matters will not appear new, nor will they appear the more convincing in virtue of this presentation. To the lawyer, enlightment might well come, though it is, in psycho-analytical thought, of doubtful value to offer generalized interpretations without adequate preparation of the recipient.

To the student and laymen open to conversion this monograph will prove stimulating and provocative. Dr. Zilboorg provides a brilliant essay on the differences and the implications of the differences, in the training of doctors and lawyers. This high spot of the lectures will provide much food for thought and his ingenious suggestion of allowing the law student to attend narco-analytic sessions, in order to learn of the existence of the deeper layers of personality structure will, I think, create some misgiving, though there may perhaps be found a sufficiently courageous school of law and of medicine to undertake the experiment.

JONATHAN GOULD.

Hypnotic Suggestion: Its Role in Psychoneurotic and Psychosomatic Disorders. By S. J. Van Pelt. Published by John Wright & Sons Ltd., The Stonebridge Press, Bristol, 1955.

This is a disappointing book, and it is regrettable that Dr. Van Pelt seems not to have decided for which audience his book is intended—Popular, Undergraduate Student, or Psychiatric.

His own original thesis, namely, that "Units of mind power are normally scattered but may be concentrated by hypnosis" coupled with his assertion that untreated neurotics have an exaggerated degree of scatter appears to contradict his later dogma that all neurosis is a matter of spontaneous development of the hypnotic state which is then continued.

His discussion of hypnosis and suggestion seems to reduce all suggestion to hypnosis and all emotionally charged mental states to hypnotic states. This would leave only logical thought outside the sphere of hypnosis and would imply that all people are hypnotized most of the time.

His case histories and indeed his discussion of the aetiology of neurosis account almost solely for secondary anxiety and he discards the unconscious and the question of choice of symptoms and symbolism.

Jonathan Gould.

The Phenomenological Approach to Psychiatry. By J. H. Van Den Berg, M.D. Published by Charles C. Thomas, Illinois, U.S.A.

In this beautifully printed and presented book Dr. Van Den Berg provides a most leisurely and readable account of the implications of the title. These implications seem to add up to a courteous and live interest in the manner in which the patient presents his account of his complaints. The thesis is that the observations of perception, whether of the outside world or of the body, described by the patient, are worthy of attention and are, for the patient, modes of presenting subjective as opposed to objective truth. Thus he who sees houses toppling in upon him is one who is thereby describing his sensation of the world collapsing about him.

The pace of the book is leisurely and its approach didactic. Some of the interpretation appears naïve and grounds are not given. This, however, may well be forgiven, for this eminently readable monograph will prove valuable, stimulating and perhaps provocative to a young psychiatrist in his first acquaintance with clinical material.

Jonathan Gould.

Isaac and Oedipus. By Eric Wellisch. Routledge & Kegan Paul, London, 1954. Pp. 131. Price 15*s*.

The late Dr. Wellisch was courageous in attempting this "Study in Biblical Psychology of the Sacrifice of Isaac".

From the anthropological point of view it is a study of infanticide. "Infanticide was practised in historic times all over the world by all races and nations." Detailed examples are given of it as practised by the French Celts, the Irish Celts, the Carthaginians, Egyptians and Phoenicians, the Moabites, the Canaanites and the Arabs, the negroes of Uganda, the Ancient Mexicans, the aborigines in Australia and by the Hindus and the Chinese. Having read the facts recorded one is quite prepared to believe that infanticide took place in any country of the world not mentioned specifically.

So powerful is the tendency that, in the case of the Myaga women of Brazil, so many of the children were killed that "the nation eventually died out". It seems as if infanticide must be a part of our nature: yet one is not prepared to believe that it is other than an aberration deriving from some undiscovered propensity.

Wellisch attributes infanticide to the father forestalling the incestual love of the son for the mother. In this Wellisch accepts Freud's findings of the Oedipus Complex,

but one is not impressed. The taboo against incest is so primitive and has been so deeply established since the dawn of the human race that it is difficult to believe that a father would really have such doubt of its efficacy that he would prefer to kill his own young child.

The extraordinary thing is that rather than infanticide being a matter of shame it has usually been a matter of religious pride. The Gods are supposed to be propitiated by the process.

Dr. Wellisch makes his study of the problem through the story of the sacrifice of Isaac by Abraham. This story "seems to describe the fundamental event on which the whole Bible stands. Its inner meaning is basic to religious development of Judaism and Christianity and also plays a dominant role in Islam". It is indeed difficult for a member of the Christian civilization to ignore the power that has been inherent in the sacrifice of the Son of God.

But Dr. Wellisch does not in any satisfactory way explain it. He pictures very clearly the conflict, usually unconscious, in the human father's mind and he says that selfless love aided by "a moral power outside man" must overcome the infanticidal wish; but he leaves unexplained the psychological impact of the "outside power" and ignores the extraordinary inhibited "power" which apparently is inherent in the infanticidal wish. Moreover he draws attention to, but does not explain, the remarkable willingness of the son to be slain.

Though the matter remains abstruse and unexplained, we are indebted to Dr. Wellisch for his book. Research will not eventually find its goal unless it values the glorious failure of earlier work, and one such is this book by Dr. Eric Wellisch.

C. E. H. TURNER.

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Emotional and Psychological Factors in Epilepsy: Physiological Background

1. An elementary seizure discharge is characterized by high amplitude, synchronized activity expressed by interlocking brain wave rhythms of different frequencies. Among various components of the electrical changes associated with convulsions, slow waves of polarization may play an important role during both ictal and postictal stages.

2. Rhinencephalic structures show the lowest threshold. Their epileptic discharges show the most intricate organization. Travelling slow waves of polarization are very easy to induce in the olfactory brain, particularly in the Ammon's Formation. Contrasting with the complexity and intensity of the electrical correlates of the seizure discharges, there is a meagerness of its "clinical" expression in animals in terms of motor activity. Awareness is impaired and certain manifestations of emotional disturbances are reported. Experiments with ablation and chemical stimulation confirm the role of the rhinencephalon in emotional control. Experiments

with sensory stimulation which reveal a high level of intergration also show an unusual reaction of hypersynchronization under certain conditions.

3. An epileptogenic excitation of a limited extent may produce psychological manifestations by a dual mechanism: (*a*) Only partial decrease of awareness may be experienced by the patient as a threat of ego dissolution and thus stir his emotional reactions. (*b*) The involvement of certain specific areas (for instance the rhinencephalon) may be expressed by disturbances of the emotional control.

4. Emotional stimuli may induce a convulsion through either (*a*) a creation of a general excitatory state with an excessive formation of either acetylcholine or insulin; or (*b*) a preliminary conditioning of certain stimuli which set up epileptogenic states in those areas of the brain which participate in the control of emotional processes ("affectogenic" epilepsy).

(Author's Abstr.)

Physiological Concomitants of the Phasic Disturbances seen in Periodic Catatonia

1. A longitudinal clinico-physiological study in the kinetic tradition has been made on 3 cases of periodic catatonia over a 2-year period. Twice- or thrice-weekly EEG records were analysed mainly for alpha rate, incidence, and amplitude, and for activity in other frequency ranges; daily estimations of the capillary blood-oxygen saturation under both resting and stressful conditions were made by an oximetric technique; and the results of all these measures were assessed in terms of objectively recorded changes in the psychiatric state and of other metabolic happenings similarly investigated.

2. In all 3 patients it was found that, starting from a relatively normal baseline in the remission phase, fairly consistent physiological changes occurred with the onset of stupor or catatonic excitement. Both the EEG alpha incidence and alpha amplitude fell sharply and simultaneously with the appearance of a disturbed phase, while the alpha rate rose steeply in 2 patients and decreased in the third at this time. In the periods of semidisturbance, whether these occurred before or after actual stupor or excitement, intermediate changes were seen.

3. A similar cycle of disturbance, closely corresponding to the changing psychomotor state, was noted oximetrically. Stupor or excitement was accompanied by capillary anoxaemia and a fall in the stress responsivity score. Both these variables underwent a recovery as the clinical condition remitted.

4. The metabolic concomitants of atypical stupor patterns and of the exhibition of thyroid extract were analysed in similar fashion and a tentative hypothesis linking these findings to the patients' varied attempts to achieve an homeostatic equilibrium in the face of stress is offered.

(Authors' Abstr.)

An Evaluation of Subcoma Insulin Therapy

In contrast with the accepted definition and efficacy of coma insulin therapy, the status of subcoma therapy is still not clear. From 1942 to 1952, subcoma insulin therapy at the Payne Whitney Psychiatric Clinic was considered to be that which produced a hypoglycemia sufficient to cause clouded consciousness lasting 45–60 minutes, but stopping short of coma. It has been used in the treatment of 212 patients during this period. There was improvement in 79·7 per cent. of 133 schizophrenic patients, and in 76·9 per cent. of 26 patients with affective illnesses. It appears that, in the treatment of certain psychopathologic reactions which occur in schizophrenic and less frequently in manic and depressed patients, subcoma insulin is a useful form of therapy. The psychopathologic reactions which are affected favorably by this treatment are catatonic excitements with marked fear, depression, or elation; acute paranoid reactions with fear, incoherence, elation or depression; schizophrenic episodes of excessive anxiety; manic excitements with marked anger or sexual excitement; and panic phases in depressive illnesses. Catatonic stupors with marked fear reacted favorably. It should be emphasized that, while many distressing symptoms can be controlled or relieved by insulin, the underlying illness is not necessarily altered.

(Authors' Abstr.)

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The Use of Frenquel in the Treatment of Disturbed Patients with Psychoses of Long Duration

In this double-blind study of the effect of Frenquel on 39 chronically hospitalized disturbed psychotic patients, the investigators were entirely unaware of whether the patients were receiving Frenquel or the placebo until after they had committed themselves on the patient's status. Despite the long-standing nature of the disturbances in behavior significant improvement was observed in a large proportion of the patients with various types of schizophrenic reactions. The authors feel these results are most encouraging for further use of this drug in patients with psychoses. (Authors' Abstr.)

Adrenocortical Function in Schizophrenia

Adrenocortical function of chronic schizophrenics was investigated. The concentration of adrenal steroids (17-hydroxycorticosteroids) in the peripheral blood was determined at 8 a.m.; after the intravenous administration of various amounts of ACTH or of a pyrogenic substance (Piromen); and after the subcutaneous injection of regular insulin. These drugs were employed to assess adrenocortical and pituitary-adrenocortical responsivity. Similar studies were made upon a comparable group of normal subjects. The adrenocortical and pituitary-adrenocortical reactivity of chronic schizophrenic and normal subjects were equivalent. There was no evidence of any impairment of adrenocortical physiology in the chronic schizophrenic patient. (Authors' Abstr.)

Four Years' Experience with Prefrontal Lobotomy

On the basis of the authors' observations, it may be said that bilateral prefrontal lobotomy has proved a useful tool in the treatment of many cases of chronic mental disease where conservative treatment has failed. There is no indication, however, that the operation really cures the patient's disease. Rather it seems to produce a new emotional equilibrium on the basis of which he can function more satisfactorily. This advantage is balanced by certain disadvantageous personality changes. Operation should, therefore, be recommended only when the patient is still capable of emotional reactions, when his thinking is not incoherent, and when the pre-psychotic history does not indicate a psychopathic personality. Another important factor is the presence of adequate family resources which would enable the patient to complete his post-lobotomy rehabilitation outside the hospital and provide the necessary guidance in the beginning of a new life in the community. (Authors' Abstr.)

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Neurologic Techniques and Rorschach Test in Detecting Brain Pathology

This study compares the validities of standard neurologic techniques with the validity of a Rorschach sign method (Piotrowski) in the diagnosis of brain disease.

The sample consists of 118 patients, all of whom were admitted to the neurology ward of a Veterans Hospital with various complaints and symptoms referable to the nervous system. All patients received thorough neurologic work-ups, including electroencephalograms, skull X-rays, and lumbar punctures. In addition, a Rorschach test had been administered to each patient as part of a psychological examination. Diagnostic procedures, such as pneumoencephalography, were performed as indicated.

The criterion groups were derived as follows: Two attending neurologists studied independently the completed hospital charts of the 118 patients. In addition, all cases had been examined in consultation by one or the other of them. They judged 84 patients as having pathology above the foramen magnum and the remaining 34 patients as presumably having no such pathology. The groups were found to be comparable in age, intelligence, education, and socioeconomic status. An index of reliability of 0·93 indicated a high agreement between the two neurologists and the pooled ratings of many comparable neurologists.

This investigation differs from previous research on brain pathology in that there was obtained (1) greater representativeness to actual practice through the selection of cases from a general hospital neurology ward, yielding a continuum of cases from extreme through borderline to no brain pathology; (2) differentiation between the group with brain pathology and the control group on the basis of intensive neurologic work-up rather than of psychiatric diagnosis, and (3) a measure of the reliability of the criterion.

The validity coefficients show that of the six diagnostic procedures studied, the Rorschach method discriminates very reliably between the organic and the non-organic groups. The EEG, the neurologic examination, and the lumbar puncture also differentiate significantly between the groups. The skull X-rays and pneumoencephalograms, however, fail to demonstrate stable differences.

In addition, the findings indicate that high call rates of brain damage are characteristic of the neurologic examination (63 per cent.) and the EEG (62 per cent.); they err mainly in the direction of calling almost 40 per cent. of non-organic cases organic. On the other hand, the Rorschach method, lumbar puncture, and skull X-rays call fewer organic cases (29 per cent., 21 per cent., and 16 per cent., respectively), and their errors are reflected in higher percentages

of "false negatives". However, the number of "false positives" for these techniques is remarkably low. They reveal a high tool accuracy (94 per cent., 95 per cent., and 88 per cent., respectively) when they call a case organic.

Because the criterion was based in part upon the neurologic techniques, and not upon the Rorschach method, the findings show that as an isolated procedure, the Rorschach is superior to the best of the individual neurologic techniques in detecting the presence of brain disease, and therefore warrants inclusion among the diagnostic consultative procedures of the clinical neurologist.

An hypothesis is stated to explain why our currently used diagnostic techniques give so many false negatives in the presence of actual disease.

(Authors' Abstr.)

Trends in the 17-Ketosteroid Excretion of Male Sex Offenders

The excretion of 17-ketosteroids has been investigated in sex offenders and compared with that of normal controls. The statistically significant findings are twofold, viz. the difference between the 17-ketosteroid day-to-night ratios for the non-aggressive sex offenders and for the controls, and between the 17-ketosteroid day-to-night ratios for the sex offenders as a whole and for the controls. Although lacking in statistical significance, other data revealed trends which appear to be worthy of further study; e.g. as compared with the controls, the average 24-hour 17-ketosteroid excretion is lower, and the average day-to-night ratio of 17-ketosteroid excretion is higher, for the sex offenders.

(Authors' Abstr.)

Arterenol (Norepinephrine) and Vascular Headache of the Migraine Type

Determinations of capillary blood pressure were made by the indirect Hooker capsule technique on 67 healthy (control) subjects and on 100 patients with a variety of psychiatric disorders. The site of examination was the skin of the dorsum of the hand.

It was found that the results of this clinical method were similar to those of the direct microintubation technique and gave a mean capillary pressure of 26·776 cm. of water in the case of the control subjects.

Capillary pressure was found to be significantly higher in the psychiatric patients than the value for the control subjects, however, results for organic dements and psychotics being greater than those for neurotics and psychopaths. The possible influence of age, within a wide adult range, was studied and found to be statistically insignificant.

Correlations between capillary blood pressures and a number of possibly related variables revealed a lack of relationship with the systolic arterial pressure, but significant interdependence with oximetrically monitored percentage capillary oxygen saturation, capillary hemoglobin levels, and capillary fragility as estimated by the positive-pressure method.

The implications of these findings in terms of the vascular anomalies of psychiatric patients are discussed.

(Authors' Abstr.)

Incidence of Seizures, with EEG Findings, in Prefrontal Lobotomy

A survey of the incidence of seizures and EEG findings was made in 181 patients subjected to 193 prefrontal lobotomies at the Veterans Administration Hospital, St. Cloud, Minn., in a period from March, 1946, to February, 1955.

Seizures were primarily of the grand mal type and occurred in 36 patients, previously seizure-free, constituting 19 per cent. of all lobotomies. The convulsions were self-limiting in 21 (59 per cent.) of this group, and nearly half of the remaining 15 patients (8 per cent. of all the lobotomies) had only occasional persistent seizures (Table I).

In general, the seizures tended to improve in the nine epileptic patients subjected to prefrontal lobotomy, and one of these patients had no further seizures after the procedure (Table I).

Seizures occurred for the first time most frequently in the immediate postoperative period. The interval varied from a maximum of 9 months in the epileptic group to 39 months in the nonepileptic group (Graph 1).

Anticonvulsant medication was not given to patients previously seizure-free until seizures occurred at a minimum of three regular intervals or were persistent irregularly.

EEG's were taken before and serially after lobotomy in a series of 100 patients consecutively fulfilling the stated criteria, from August, 1949, to February, 1955.

EEG abnormalities were observed in 18 per cent. of the patients before lobotomy, most of which were due to effects of electrotherapy.

The abnormalities increased to 78 per cent. in the immediate postoperative period, rapidly improved in the next four months, levelled off, and improved again until there were no abnormal EEG's in the patients current at the fourth postoperative year (Graph 2).

The types of abnormalities were primarily of the S-3 type (1 to 3 waves per second) and were located most frequently in the frontal areas.

Focal abnormalities seemed to predominate in the right frontal area, with some tendency to alteration of the focus to the left.

There was little significant relationship of abnormalities of the EEG to clinical results and incidence of seizures.

There was an apparent relationship between the large number of grand mal seizures from electrotherapy and the increased incidence of seizures after lobotomy.

(Author's Abstr.)

Chlorpromazine (Thorazine) Treatment of Disturbed Epileptic Patients

The period of observation is admittedly quite short and the series small, but the results so far observed among the most disturbed epileptics in the institution indicate the following conclusions:

1. Chlorpromazine (Thorazine) has been highly effective and dramatic in controlling behavior disturbances.
2. The drug can be safely administered with fairly large doses of phenobarbital with minimal risk.
3. Doses of 300 mg. or less are less likely to be involved in complications.
4. A maintenance dose may be necessary to retain control of both episodic and chronic disturbed states.
5. Chlorpromazine does not appreciably reduce the frequency of seizures when maintenance therapy of phenobarbital or diphenylhydantoin (Dilantin) is reduced.

(Author's Abstr.)

A New Treatment of Status Epilepticus

A description is given of the anticonvulsive effect of an intravenously administered local anesthetic (lidocaine) on prolonged epileptic attacks in 10 human cases. Lidocaine in intravenous drip was found to be of great use in the treatment of status epilepticus. It was also found that a barbiturate in doses too small to influence the epileptic attack increases the anticonvulsive effect of lidocaine. Since the supplementary dose of the barbiturate can be kept so low that the complications of its sedative effects are avoided, this combination therapy is to be recommended in the treatment of severe status epilepticus. Therefore this treatment is especially useful against epileptic fits occurring during the early post-operative course in cases of brain operations.

(Authors' Abstr.)

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Combined Reserpine-Chlorpromazine in Treatment of Disturbed Psychotics

Chlorpromazine clinically has a potentiating effect on reserpine. Combined reserpine-chlorpromazine therapy is effective in chronically disturbed psychotic patients and has certain advantages over uncombined reserpine therapy. Experience with more than 300 patients is discussed.

Toxic side-reactions, including jaundice and agranulocytosis, are described.

As a result of drug therapies, it has been possible to eliminate electroconvulsive treatments in the chronically disturbed psychotic patients.

(Authors' Abstr.)

Diagnosis and Prognosis in Aphasia

It is suggested that aphasic symptoms be considered, first, in relation to three cerebral systems involved in language processes: the auditory, visual, and sensorimotor systems; and, second, in relation to the four language modalities in which impairment may be observed: understanding what is said, reading, speaking, and writing. Relationships between processes involved and functions impaired are complex, but differential diagnosis is possible through relatively simple procedures. These procedures are described and findings analysed in terms of resulting patterns of impairment.

Observed patterns are stable and can be identified by specific diagnostic criteria, and each carries a specific prognosis.

Recurring patterns were (1) a pattern of severe damage, for which prognosis is poor; (2) impairment of reauditorization (auditory retention and recall), reflected in all language modalities, for which prognosis is excellent, and impairment of reauditorization with (3) coexisting visual involvement, (4) sensorimotor involvement, or (5) generalized brain damage.

When specific visual involvement was present recovery of speech was good, but progress in reading and writing was slower, and extent of recovery related to degree of involvement. When sensorimotor involvement was present, recovery was slow, but functional skills were obtained in all language modalities. When generalized brain damage was present, speech improved as a result of strong auditory stimulation, but other significant changes did not tend to occur. General principles of treatment are indicated for each group, in order to help the physician make recommendations for treatment. (Author's Abstr.)

A Controlled Study of Reserpine on Chronically Disturbed Patients

The 90 most highly disturbed male patients with chronic mental illness in a 2,000-bed hospital were placed on one ward. Thirty were given 1 mg. of reserpine (Rau-Sed, Squibb) orally b.i.d.; 30 were given an identical-appearing placebo, and 30, no medication, for a period of 12 weeks. They were also studied for four weeks prior to and four weeks subsequent to this period. Measurements were made of behavior, blood pressure, and weight.

Reserpine in oral dose of 1 mg. b.i.d. did not effect a behavioral improvement (as measured by the L–M Fergus Falls Behavior Rating Scale) in chronic disturbed male patients.

Reserpine effected a lowering of blood pressure.

Reserpine effected a slight weight gain.

The greater attention to patients inherent in taking blood pressures and weights and increasing the interest of ward personnel resulted in behavioral improvement in all three groups under study. (Authors' Abstr.)

The Use of Reserpine in an Acute Psychiatric Treatment Setting

One hundred and one cases treated with reserpine were studied in the setting of an acute psychiatric treatment hospital.

The dosage and treatment technique were modified according to the clinical state of the patient. Patients severely disturbed with moderate to marked psychomotor activity were treated with high doses of reserpine (7 to 13 mg. per day), usually for 7 to 14 days. Those with mild to moderate overactivity or severe anxiety were placed on moderate doses of the drug (4 to 6 mg. per day). Patients with less severe symptoms than those in the above categories were treated with low doses of the drug (1 to 3 mg. per day). Modification of dosage was made according to the patient's clinical response and complicating side-effects of the drug.

Common complications of the reserpine therapy were hypotension, weakness and fatigue, dizziness, nasal congestion, and drowsiness. Other side-effects noted, of less frequency, were the Parkinsonian syndrome, feeling of loss of control, diarrhoea, depression, and allergic responses.

The drug appears to be of definite value in the management and treatment of schizophrenia. Secondary symptoms of the illness are reduced or removed, but the primary process is still in evidence. However, this improvement fosters interpersonal contacts of a social and psychotherapeutic nature. Where previously a state of pessimism existed among ward personnel and physicians toward the schizophrenic patients, with reserpine, interests and enthusiasm for their treatment develop, which, in turn, undoubtedly play a very important role in the recovery of the patients.

Slight alleviation of anxiety and related neurotic symptoms occurs with reserpine, but this is frequently a transitory response, and the drug appears not to be a substitute for psychotherapeutic measures.

The drug has value in the alleviation and control of the disturbed behavior and other symptoms of acute and chronic brain syndromes.

This preliminary study indicates the need for more careful and controlled evaluation of the therapeutic efficacy of reserpine. (Authors' Abstr.)

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Combined Hydrogenated Alkaloids of Ergot in Mental and Nervous Disorders Associated With Old Age

A study of hydergine using the double-blind technique was made in 26 patients with psychoses associated with old age. Unequivocal improvement was noted in two patients with chronic brain syndromes due to hypertension who were treated with hydergine. Equivocal improvement was noted in 6 other patients of 13 who received hydergine and in 1 patient of 13 treated with placebos.

The improvement in the patients with chronic hypertensive brain disease was limited to mental and behavioral changes. It was characterized by decreased irritability and confusion, diminished delusions and ideas of reference, and increased sociability. Hydergine seems to be of value in the treatment of mental disorders associated with chronic hypertension.

Hydergine was subsequently found to be of considerable value in the treatment of a patient with an acute brain syndrome due to hypertension and in a patient with an acute cerebral vascular accident. In the latter patient, hemiplegia was nearly completely relieved, the result being comparable to the best results obtained from the use of cervical sympathetic block. Hydergine would appear to be indicated in these conditions, if hemorrhage is first ruled out. (Author's Abstr.)

Treatment of Depression with Meratran and Electroshock

1. A new central stimulant, Meratran, has been studied in a series of patients with depression. The oral dose is 1·0 mg. to 2·0 mg. t.i.d. and the single parenteral dose, 2·0 mg. given intravenously or intramuscularly.

2. A satisfactory therapeutic response was obtained in patients with reactive depressions, while less frequently favorable results were obtained in the endogenous, psychotic, and involutional types.

3. In patients who require electroshock therapy, the adjunctive use of Meratran appears to hasten the recovery and diminish the frequency of maintenance electrical treatments.

(Author's Abstr.)

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The Electroencephalogram of Psychomotor Seizures in Childhood

1. An analysis was made of interictal and some ictal electroencephalograms of 110 children (age 1½ to 16) with psychomotor seizures.

2. The predominant findings in the waking state were classified as: normal or borderline (37), focal temporal spikes or sharp waves (11), bilateral temporal spikes or sharp waves (1) focal frontal spikes (3), focal slow waves (9), bilateral synchronous 3 c/sec. spike and wave (14), bilateral atypical 1½ to 3 c/sec. spike and wave (20), bilateral synchronous delta (9), random delta (6).

3. Recordings during sleep in 92 cases contributed little more information. In only four cases were focal temporal spikes further delineated; however bitemporal spiking appeared in eight anew. In fourteen cases previously definite slow-wave foci or bilateral spike-wave discharges were either obscured or did not appear.

4. Psychomotor seizures in childhood therefore, may be associated with a variety of electroencephalographic abnormalities. Focal temporal spikes are relatively infrequent and are elicited in only slightly higher incidence by sleep. There is a high incidence of spike-wave discharges of both bilateral synchronous 3 c/sec. and atypical forms in children with and without additional petit mal seizures. This general picture is in great contrast to that in adults with apparently similar psychomotor seizures.

5. The problems of classification with regard to these psychomotor seizures and the so-called petit mal status or petit mal automatism are reviewed. Differential features between these electroencephalograms and those of children with non-epileptic behavior disorders are noted.

6. Possible pathophysiologic factors relating to temporal or limbic cortex, and the midline thalamo-reticular projecting and centrencephalic systems are discussed relevant to the production of these psychomotor seizures and the focal spike and bilateral non-focal spike-wave discharges in the electroencephalograms.

(Authors' Abstr.)

Supersensitivity of the Sensory Cortex Following Partial Deafferentation

1. The loss or diminution of the spontaneous electrical discharges of the sensory cortex following lesions or destruction of the ipsilateral ventral posterior thalamic nuclei is often only transitory (experiments in cats). It may be followed by a tendency to periodic burst discharges or by a continuous activity of increased amplitude that may be subject to spontaneous fluctuations.

2. The development of a hypersensitivity of the respective cortical area to toxins such as Mecholyl or Metrazol could be demonstrated. Mecholyl may accentuate an existing or bring to light a latent asymmetry of the spontaneous discharges and/or the tendency to burst discharges.

3. Stimulation of sensory nerves (ulnar, sciatic) is still able to elicit evoked potentials (secondary responses of Forbes) in the sensory cortex deprived of its connections with the ventral posterior thalamic nuclei. On bilateral peripheral stimulation with single shocks, one notices that the secondary response is more pronounced in the sensory area corresponding to the thalamic lesion than in the opposite cortex; this difference becomes more marked under the effect of Mecholyl.

4. These findings may have bearing upon the development of pain and hyperpathia in cerebral lesions extending into the white matter below the sensory cortex.

(Authors' Abstr.)

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The Neurological Basis of Memory Defects Following Electroconvulsive Therapy

1. Five kinds of memory defects following electroconvulsive therapy are listed.

2. The most common of these defects, spotty or lacunar memory defect after the treatment course, cannot be classified as being of "organic" type on either clinical or histopathologic grounds.

3. A theoretical construct is devised to explain the phenomenology of this type of memory defect, as well as the symptom of anxiety which often accompanies it.

4. The Pavlovian concept of the development of the ultraparadoxical phase of cortical activity is invoked to explain these clinical disturbances. It holds that the electroshock stimulus is excessive or ultramaximal, that it produces a perversion of the physiologic state of the brain mantle to one of massive inhibition rather than excitation, that the levels of inhibition are deeper in some areas than others, and that some areas undergo prolonged or refractory states of inhibition.

5. It is contended that the presence of a mosaic-like distribution of areas of refractory inhibition expresses itself clinically as lacunar memory defect.

6. The development of anxiety is believed to result from the induction of fields of neural excitation around such areas of refractory inhibition.

7. It is held that the areas of refractory inhibition are reactivated by random excitatory stimuli impinging on the brain in the ordinary course of living, so that the memory defect rights itself with the passage of time.

8. Non-convulsive electrical stimulation provides the same kind of varying random excitatory stimuli as does the ordinary course of living, but in a much shorter and more concentrated way, and is a more effective method of allaying the memory defect.

(Author's Abstr.)

Differential Effects of Lesions of the Mediodorsal Nuclei of the Thalamus on Normal and Neurotic Behavior in the Cat

Stereotactic lesions were placed in the mediodorsal nuclei of the thalamus in 8 normal cats and in 9 others which had been trained in various feeding techniques before being made experimentally neurotic. The lesions produced the following effects:

1. Extensive amnesia for previous learning in all animals.

2. Concomitant amelioration of acquired neurotic behavior.

3. Diminution in the speed of and capacity for new learning, in that motivation was retained but the animals were perseverative and stimulus-bound.

4. Impairment of olfactory responses to the extent that the animals could not find food by the sense of smell, were unable to use odors as cues even after from 6 to 11 months of retraining, and showed only a crude, generalized olfactory response.

5. Intensified affective behavior in relation to other animals and toward humans.

6. A change in characteristic social responses, dependent on the preoperative experiences of the animal, i.e. cats which had been made experimentally neurotic were significantly more aggressive after mediodorsal thalamotomy than were normal controls after the same operation.

(Authors' Abstr.)

The Cingulate Gyrus in Relation to Consciousness

1. Bilateral ablation of the rostral cingulate area in monkeys and cats has produced significant alteration in behavior.

2. Removal of the cingulate gyrus alone in the cat causes akinesia and plasticity together with marked automatism.

3. Removal of the homologous area in the more elaborate brain of the monkey causes the syndrome of passive and non-aggressive behavior previously described by others. There is no akinesia or plasticity.

4. When minimal injury to the rostral premotor regions is added, akinesia is marked and apparent apraxia results.

5. Addition of cingulate ablation to either frontal or temporal pole ablation intensifies and modifies the syndromes characteristic of the primary removal of each of these areas.

(Author's Abstr.)

Some Behavioral Effects Associated with Feeding Sodium Glutamate to Patients with Psychiatric Disorders

In a series of observations of patients with psychotic disorders, made over a period of 11 months, examiners, completely unaware of which patients were alternately placed on sodium glutamate or placebo, rated the patients for psychological, physiological, biochemical and behavioral effects. The statistical analyses of perceptual and motor co-ordination tests failed to disclose any significant changes associated with glutamate feeding. Similarly basal metabolic rate, EEG, ECG, pupillary dilatation, blood pressure, heart rate, respiratory rate, oral temperature and weight did not reveal consistent alterations as a result of the medication.

In contrast, 17 of 27 patients receiving monosodium glutamate showed clinical improvement; 16 in action, 12 in emotion, 9 in intellection, 8 in interpersonal relationships, 5 in thought processes and 2 in insight. Equally good results were obtained with 15 grams 3 times daily or 5 grams 3 times daily while toxic side reactions sometimes seen with the larger doses were avoided. The authors realize that they have studied a small group of patients. Whether or not the same conclusions would be revealed by the examination of a larger number of patients can be decided only by further work.

Their biochemical studies disclosed that even with 15 grams of glutamate administered 3 times daily the level of that substance in the blood was raised above the normal for periods of only one-half day or less. In the course of the biochemical studies a possible cause for the discrepancy in the literature was uncovered, namely that previous investigators had fed glutamic acid in three different forms: glutamic acid hydrochloride, glutamic acid and sodium glutamate, compounds not equally absorbable into the blood stream.

(Authors' Abstr.)

Occipital Lobes, Dreams and Psychoses

Since the convex cortex of the occipital lobes, often only on one side, is essential to revisualization of former experiences, to dreams and to some psychoses, it might be possible

to relieve the psychosis by decortication of one occipital lobe. The patient would be able to retrain the other for new memories but should no longer be disturbed by unintended revisualization of old experiences.

Since this paper was written, two cases of tumor of the left occipital lobe have been studied with loss of ability to revisualize and to dream. In one case there was a right homonymous hemianopia, in the other, an upper right quadrantanopia. In a third case a young woman was struck in the occipital region with a hammer which depressed the skull and caused immediate blindness. Exploration showed both occipital lobes damaged and a double dural tear, one on each side of the midline. Some vision slowly returned but the patient did not dream after the blow.

(Author's Abstr.)

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Induction of Sleep by Autonomic Drugs

1. Atropine, prostigmine and acetylcholine, administered as described by Hoffer, produce drowsiness, light and moderate sleep resembling natural sleep, as recorded in the EEG.

2. Patients whose EEG show paroxysmal abnormalities (epileptics and schizophrenics) are more susceptible to this procedure than patients (schizophrenics) who show no paroxysmal abnormality in their EEG.

3. Normal control groups respond with a mild reaction when compared with Group 1.

4. There seems to be a positive correlation between sympathetic hyper-reactivity and sleep activation.

5. A tentative explanation is offered as to the mode of action of the above drug combination.

(Authors' Abstr.)

Chlorpromazine in the Treatment of Schizophrenia

The effect of Chlorpromazine (Thorazine) was studied in 75 chronic hospitalized psychotic patients. The maximum dosage used in this study was 400 mg. Marked to moderate improvement was obtained in 25 patients. These 25 patients represented all the diagnostic categories found in the state psychiatric hospital. They were all management problems because of their disturbed, regressive behavior. The response to treatment varied from a dramatic change in a few days to a reaction which only began to take place after 8 weeks of treatment. The patients displayed their improvement by becoming quieter, less tense, less reactive to their autistic thinking, and more amenable to the suggestions and care of the nursing staff. Of these 25 patients, three have been discharged from the hospital, and five now have ground parole privileges. Many of the patients who have shown improvement have shown also a gain in weight.

Three of our cases developed transient jaundice. Three cases developed a transient Parkinsonism-like reaction. There were several cases of dermatological reactions.

It is concluded that Chlorpromazine (Thorazine) has brought about a new and effective approach in the treatment of the chronically overactive psychotic patient, and must be considered an important therapeutic agent in the armamentarium of the psychiatrist.

(Author's Abstr.)

Physiologic Pathology in the Schizoid and Affective Psychoses

All the work in this study has gradually led to the recognition of different types of nervous activity, depending upon the varying homeostasis, measurable as physiologic adaptability.

The constitutional inferior or physiologically immature organism has a definite profile of physiologic inadequacy. When this type of individual is subjected to too much stress of any sort, there are abortive attempts at reaching physiologic equilibrium, particularly in the serum globulins. It is this attempt at adaptation that is synchronous with the precipitation of the insanity.

In the immature, or schizoid, type, when well the figures take the physiologic profile of the constitutional inferior. In the very sick immature individual the serum protein figures usually seem to be within standard normal proportions, but this is misleading. The figures are the evidence of challenge and inadequate effort at adaptation.

In the unstable, or manic depressive, type, when sick there is a reversion of the physiology of the physiologically immature, and with this reversion there appears an insanity. When sane thinking appears the physiologic status is reversed from that observable in the insane and this reversed pattern can be considered as the individual's normal or possibly his original constitutional pattern. This physiologic profile makes quite a standard normal picture.

The recognition of the type of activity of a nervous system can be determined by the study of the physiologic adaptability.

We do not know yet why the body reactivity does not function adequately, as in the physiologically immature person; possibly it may be genetically explained, with a poor nervous system, with poor integration, with an endocrine background. This poor reactivity lays the personality open to many derangements by environment, or infection, or other stress.

In the consideration of these points of the equilibriums that are the physiological adaptations there is a means of measuring the ability to meet stress.

(Authors' Abstr.)

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Long Range Treatment of Multiple Sclerosis with Pancorphen

This article deals with the question whether a series of 5 Pancorphen injections which yielded a high percentage of partial remissions of non-permanent nature in a large number of cases should be repeated and how often. Can the author expect on repetition: (1) a cure of the disease? (2) prevention of new attacks? (3) lengthening of intervals between the attacks? (4) shortening or cure of new attacks?

The author bases his conclusions on 7 cases of multiple (more than 3) treatments from Goldwater Memorial Hospital. To these cases he could add 6 more cases from his previously published series. All these cases were treated and followed for years.

His tentative conclusions from these thirteen cases are: (1) even old and advanced cases can still yield partial remissions of various degrees; (2) this result can often be repeated; (3) there is no doubt in most instances about the sequence and the probable causal nexus between treatment and remission; (4) repeated treatments given in time can favorably influence the course of the disease; (5) the treatment in the form hitherto described produces no cure; (6) a repetition of the treatment from 4 to 26 times in its present form does not arrest the disease or protect from relapses in the future; (7) very advanced cases give less favorable results than less advanced; (8) treatments started in the beginning of an attack give much better results than those started late in the attack; (9) treatments given 2 to 3 times per year are probably better than those given at longer intervals; (10) treatments given in a remission period probably further the progress of remission; (11) progressive type of remission is more frequent with Pancorphen treatment than without it; (12) the interval between bouts of disease is not shortened, but the total time spent in attacks is shortened; (13) the duration of an attack is shortened to a point that he can speak of "aborted attacks".

Should the treatment be continued indefinitely 3 times a year in series of five injections? More experience with much longer periods of treatment will be necessary to answer this question conclusively.

The author is convinced that the treatment should be given: (1) in every beginning attack; (2) in progressive (active) attacks no matter of what duration; (3) during inactive as well as progressive remissions. It is true that treatment in active stages requires more caution and still more individualization than in the active stages; it is also true that any aggravation of the disease in a progressive attack is likely to be interpreted not as absence of therapeutic effect but as iatrogenic aggravation. Nevertheless it is logical to assume and corroborated by experience that the active periods of disease, progressive or new attacks as well as progressive remissions, hold more promise for any therapy than the inactive periods of stabilized defenses which also yield therapeutic results.

For the time being he recommends therefore: continuous treatment with series of five intravenous injections, strictly individualized (5) three to four times per year plus extra emergency treatment in case of appearance of new symptoms.

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A New Scale for Evaluating Disability in Multiple Sclerosis

A new classification of disability in multiple sclerosis is presented wherein a status number is provided in accordance with the patient's impairment due to neurologic dysfunction. The scale consists of ten progressive steps or classes. The scale has been applicable in the more than 300 patients studied at this hospital, and has proved satisfactory in measuring change in status of these patients during hospitalization.

(Author's Abstr.)

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Vomiting: Neural Mechanisms and Control by Chlorpromazine

1. Vomiting is primarily a function of the respiratory and not of the gastrointestinal system.

2. Vomiting is controlled by a neural mechanism consisting of a superficial area (chemoceptive trigger zone) located in the area postrema in the fourth ventricle and a coordinating center in the lateral reticular formation of the medulla oblongata. The chemoceptive trigger zone is composed of specialized cells which are sensitive to circulating chemical agents, and, when properly stimulated, activates the more deeply placed reticular vomiting center. The latter may also be activated directly by visceral afferents from the gut.

3. Chlorpromazine, a clinically effective antiemetic, has been found to act on both of these areas. In small doses it is believed to compete with circulating emetic agents for receptors in the chemoceptive trigger zone, thus acting as a competitive inhibitor. In larger doses it has been shown to have a depressant effect directly on the reticular vomiting center itself.

(Authors' Abstr.)

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Clinical Trial of a New Anticonvulsant, SKF No. 2599

A clinical trial of a new anticonvulsant, 5,5-diphenyl-tetrahydroglyoxaline-4-one (SKF No. 2599), has been continued for a period of six months in 22 patients with grand mal or psychomotor seizures which were previously uncontrolled despite prolonged treatment with Dilantin and/or phenobarbital. The majority of patients were mentally retarded and 45 per cent. had cerebral palsy.

The epilepsy was controlled completely in 12 (55 per cent.) of the 22 patients, and a practical level of control was obtained in six (27 per cent.). Among the patients whose seizures were well controlled, three had psychomotor epilepsy. The average optimal daily dose was 0·8 gm. (20 mg./kg.).

Side effects, which resembled those produced by Dilantin, involved the central nervous system and the gastrointestinal tract; the incidence of gum hyperplasia, however, was minimal.

Compared with existing anticonvulsant compounds, (SKF No. 2599) has exhibited definite advantages in this preliminary clinical evaluation, and more extensive trial is recommended, particularly in noninstitutionalized epileptic patients.

(Authors' Abstr.)

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A Study of Free Amino Acids in the Human Cerebrospinal Fluid

1. The tedious procedure of paper chromatography of the cerebrospinal fluid has been modified to allow rapid, accurate routine identification of the constituent amino acids. This has been accomplished by modifying the desalting apparatus of Consden and developing an apparatus for the automatic concentration of spinal fluids in a small spot on chromatographic paper.

2. Multiple analysis of the amino acids in normal cerebrospinal fluid has permitted the identification and quantitation of 15 amino acids, including aspartic acid, alanine, arginine, alpha-amino-butyric acid, glycine, glutamic acid, glutamine, gamma-amino-butyric acid, lysine, phenylalanine, serine, tyrosine, threonine, valine, and leucine.

3. The analysis of 193 specimens of cerebrospinal fluid from patients with central nervous system disorder has demonstrated three additional amino acids, including proline, histidine, and cystine. Statistically significant alterations in the free amino acid content were noted in cases of hereditary cerebellar ataxia, multiple sclerosis, and presenile psychosis. Suggested changes were present in albinism, Huntington's chorea, and tabes dorsalis.

4. It is anticipated that further studies will demonstrate amino acid alterations in the cerebrospinal fluid of other central nervous system diseases.

(Author's Abstr.)

Effect of Barbiturates on Latent Motor Deficits

1. One hundred and forty-four patients were studied for motor weakness under sodium Amytal injection, including 37 control patients. In none of these controls was a motor deficit elicited under the sodium Amytal test.

2. In the experimental group of patients with lesions involving a part of the central nervous system which mediates motor function, the injection of 150 to 500 mg. of sodium Amytal brought out motor weakness which was not elicited in the premedication examinations.

3. A minimal or suspicious motor deficit was made more conspicuous under sodium Amytal injection.

4. The sodium Amytal test is simple and sensitive for detecting motor weakness of central origin. It is recommended as a supplementary procedure whenever its use is indicated. A positive result indicates damage to the central nervous system.

(Authors' Abstr.)

Isonicotinic Acid Hydrazide in Multiple Sclerosis

1. A series of 32 patients with multiple sclerosis were given either INH or placebo preparation in a double blind procedure and observed for a period of three months. Two methods of clinical assessment were used.

2. On the Kurtzke-Berlin scale of functional improvement, 25 patients remained in the same category. No patient improved by more than one category. Three patients improved by one category. All three received INH and were initially seen during an acute exacerbation. Four patients were worse by one or two categories. Two received INH and two received the placebo.

3. The second scale of clinical assessment was based on a general estimate of the patient's status at the end of the therapy. Seven patients from the INH group and three patients from the placebo group improved. Five patients from the INH group and four patients from the placebo group were worse. Thirteen patients remained unchanged.

(Authors' Abstr.)

Treatment of Headache with Reserpine

Reserpine was given orally to 220 patients with chronic headache. Preliminary clinical evaluation in patients with hypertension showed considerable improvement, those with tension headache showed moderate improvement, and those with migrain obtained no definite relief. The present report is too short a survey time in treatment to draw final conclusions as to the effectiveness of reserpine in the treatment of chronic headache.

(Author's Abstr.)

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The Limbic System ("Visceral Brain") in Relation to Central Gray and Reticulum of the Brain Stem

The limbic system has been defined, and a number of anatomical details have been briefly considered. Reference has been made to the body of evidence that has shown this system to be fundamentally implicated in emotional and viscerosomatic functions.

Attention has been directed to the unexplained similarity of some of the psychiatric aberrations seen in cases of encephalitis lethargica and in patients with epilepsy secondary to lesions in or neighboring the frontotemporal portion of the limbic cortex. A possible explanation has been suggested by an inferred interplay between limbic structures and circumscribed region of the brain stem that von Economo, on the basis of his pathological study of encephalitis lethargica, believed to be of vital significance in emotional processes. The region he delineated includes central gray and reticulum and lies in contiguous parts of the diencephalon and midbrain.

Behavioral and electrophysiological observations have been described which offer supporting evidence of the interdependence of limbic structures and the region delineated by von Economo in emotional processes. Some of the psychological and psychiatric implications of these studies have been considered.

(Author's Abstr.)

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Electroencephalographic Changes in Man Correlated with Blood Alcohol Concentration and Some Other Conditions Following Standardized Ingestion of Alcohol

A standardized oral dose of 1·25 g. of ethyl alcohol per kg. of body weight was administered to 10 male hospital attendants and 10 hospitalized male alcoholics.

Blood alcohol concentrations, electroencephalograms, electrocardiograms, and degree of ataxia were determined, recorded and observed at constant intervals during 4½ hours. Blood-sugar values were determined at the end of each experiment.

The following main results were obtained:

1. The blood-alcohol curves during the experiments were largely the same in both attendants and patients. The maximums ranged between 108 and 196 mg. per 100 ml. and were somewhat (but not significantly) higher in the patients.

2. EEG frequencies shifted between 0·7 and 3·0 c.p.s. toward slower ranges (average 1·4–1·5 c.p.s.), and the amplitudes at the same time increased by about 50 to 100 per cent.

There was no statistically significant difference between the two groups, although the frequency drop seemed a little less in the patients than in the attendants.

3. In the patients the maximum EEG changes coincided with maximum blood alcohol concentrations, whereas in the attendants, who were significantly younger and less habituated to alcohol, the EEG changes remained on the average 45 minutes after the maximum blood alcohol concentrations. This was probably due to the drowsiness that followed direct intoxication in the attendants. It is suggested that this lag, which concerns not only the EEG but also sensory functions, may have considerable importance as a risk factor in traffic.

4. The heart rate underwent marked changes. Following a preliminary short excitation, a retardation—most obvious in the attendant group—became prevalent. In the attendants, but not in the patients, a new abrupt increase associated with nausea was observed, and finally another decrease associated with drowsiness.

5. The patients were in every way less affected by the alcohol, although their blood alcohol concentrations were slightly higher. The drop in EEG frequency was not as great nor as protracted (difference not statistically significant), and the pulse reactions were less pronounced (almost significant) and less complex. There was hardly any nausea and still less drowsiness. The degree of ataxia caused by the ingested alcohol was less pronounced in the patients than in the attendants (difference almost significant). The difference in the general state of intoxication was readily observed. The greater stability of the patients might be explained by their greater habituation to alcohol but not by their higher age.

(Authors' Abstr.)

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The Toxic and Metabolic Effects of General Anesthetic Agents on the Central Nervous System. Dripps, Robert D. (*Univ. of Pennsylvania, Philadelphia*). [*Ibid.*, 432-8.]

Effects of Ionizing Radiation on the Adult and Embryonic Nervous System. Hicks, Samuel P. [*Ibid.*, 439.]

Effects of Heavy Metals on the Central Nervous System. Aring, Charles D., and Trufant, Samuel A. [*Ibid.*, 463.]

The Effects of the Organic Solvents and Industrial Poisonings on the Central Nervous System. Baker, A. B., and Tichy, Fae Y. [*Ibid.*, 475.]

The Effects of Bacterial Toxins on the Nervous System. Gammon, George D. [*Ibid.*, 506.]

The Effect of Alcohol on the Nervous System. Victor, Maurice, and Adams, Raymond D. [*Ibid.*, 526.]

W. M. Sperry (Chem. Abstr.)

The Qualitative and Quantitative Determination of Thorium in the Brain of Subjects Injected with Thorotrast for X-ray Examination. Brusa, A., et al. [*Arch. ital. anat. embriol.*, **57**, 162 (1952): *Biol. Abstr.*, **27**, 1526 (1953).]

Traces of Th were found in all cases (5 tumors and 2 postmortem brains) by radiographic examination of sections. The amount of Th established by the Geiger-Muller autoscalar and by spectrography, 6 days after injection of 24 ml. of thorotrast (=6 g. of ThO_2), gave the following results: 0·138 g. of ThO_2 in the brain; 0·057 g. of ThO_2 in the spleen.

A.M.M. (Chem. Abstr.)

Fluoroacetate and Fluorobutyrate Convulsions in the Isolated Cerebral Cortex of the Dog. Hendershot, Leland C., and Chenoweth, Maynard B. [*J. Pharmacol. Exptl. Therap.*, **113,** 160 (1955).]

In curarized dogs (artificial respiration) Na fluoroacetate (I) or Me γ-fluorobutyrate (II) was injected into pieces of cerebral cortex isolated from the rest of the cerebrum by circumscribed cutting and undercutting. Electroencephalograms from leads placed in various parts of the brain showed that (I) and (II) produced localized convulsive seizures. Citrate accumulated in the brain cells involved. Antidotes specific for (I) (glycerol monoacetate) and (II) (glycerol monobutyrate) prevented the convulsive seizures but did not prevent the accumulation of citrate; this indicates that the high citrate levels occurring in fluoro-fatty acid poisoning are not responsible for the appearance of toxic symptoms. Furthermore, the convulsive activity can spread from the isolated piece of cortex to adjacent areas without an increase in citrate in such areas.

L. E. Gilson (Chem. Abstr.)

The Antihyaluronidase Content of the Serum in Multiple Sclerosis. Konyves-Kolonic, L., et al. [*Monatsschr. Psychiat. Neurol.*, **128,** 153 (1954).]

The antihyaluronidase content of blood serum, determined by the method of Haas, was lower in most of 17 patients with active multiple sclerosis (m.s.) than in 54 patients with chronic or slowly progressing (m.s.). Most of the values in (m.s.) patients were within the wide range found in control subjects.

Warren M. Sperry (Chem. Abstr.)

Disturbances in Copper and Amino Acid Metabolism in Hepatocerebral Degeneration and Their Treatment with BAL. Steger, J., and Steger, R. [*Deut. Z. Nervenheilk.*, **172,** 321 (1954).]

The average α-amino N(I) excretion in urine in mg./24 hours, determined by the method of Pope and Stevens, was 180 (91–270) in 13 control subjects (26 determinations) and 271 (19–624) in 4 patients (109 determinations) with hepatocerebral degeneration (h.c.d.). The average concentrations in mg. 1/100 ml. urine were, respectively, 25·4 (14–44) and 35·4 (13–102). The average concentrations of (I) in mg./100 ml. blood serum were 3·83 (3·4–4·5) in 4 control subjects and 5·89 (4·4–7·3) in 4 patients with (h.c.d.). The average Cu excretion in urine in γ/24 hours, determined by the method of Eden and Green, was 19·6 (15·7–34·7) in 6 control subjects, 27·0 (3·9–88) in 15 patients (45 determinations) with multiple sclerosis (m.s.), 26·5 (16·8–51·0) in 5 patients (19 determinations) with (h.c.d.). The average concentrations in γ Cu/100 ml. urine were 2·6, 3·1, 2·9, and 27·4 respectively. The average Cu concentrations in γ/100 ml. blood serum were 128, 134, and 83 in control subjects and patients with (m.s.) and (h.c.d.) respectively. The urinary excretion of Cu by (h.c.d.) patients during the 4 hours after the intramuscular injection of 200 mg. of 2,3-dimercaptopropanol (BAL) was greatly increased. Continued treatment with large amounts of (BAL) (maximum, 2·8 g.) caused a large elimination of Cu with increased concentrations in the blood serum. In 1 patient the Cu excretion in bile (determined in duodenal fluid) was increased by (BAL) injection. (BAL) had no effect on (I) excretion.

Warren M. Sperry (Chem. Abstr.)

Amino Acid Metabolism and Wilson's Disease. Chessa-Perle, Elio., Careddu. Paolo. [*Pediatria*, **62,** 411 (1954).]

Amino N(I) of serum was 4·5 and 8–9 mg. per cent. respectively, at fasting and after a high protein diet in a patient (II) with Wilson's disease and a healthy individual (III). The urinary excretion of (I) was 350–400 and 150 mg. per 24 hours respectively, for the 2 subjects; the high protein diet did not influence it as much in (II) as in (III). Paper chromatograms of urinary amino acids showed glycine and alanine in (III), and aspartic acid, glutamic acid, serine, taurine, lysine, arginine, leucine, phenylalanine, and tyrosine in (II). The high protein diet caused the appearance of phenylalanine and tyrosine in (III). After cystine administration, a small amount appeared in serum chromatograms of (II) (more in (III)) but urine chromatograms showed appreciable amounts. The origin of aminoaciduria in the above disease is ascribed to the kidney.

C. Scandura (Chem. Abstr.)

Significance of Adrenal Function in Carbohydrate Metabolism in Nervous Disease. Schmidt, R. M., and Schliecker, W. [*Arztl. Wochschr.*, **10,** 221 (1955).]

For adequate determination of the work capacity of the neuro-endocrine system, the Albrich-Bertschinger adrenal-function test should supplement the adrenaline test. Ten cases of muscular disease, after 15 minutes of exertion, failed to show the work hyperglycemia (I) exhibited by 10 normal subjects after subcutaneous injection of 1 unit of insulin (II) per 6·5 kg. body weight. The fasting blood sugar (III) in both groups returned to normal within 3 hours. Five cases with disorders of the vegetative system reacted with normal (I) after (II), but (III) remained below normal after 3 hours. The diagnostic value of these tests is discussed.

Jean Pinchack (Chem. Abstr.)

The Influence of Shock on Cerebral Hemodynamics and Metabolism. Fazekas, Joseph F., et al. [*Am. J. Med. Sci.*, **229**, 41 (1955).]

Patients in shock showed a reduction in rate of cerebral blood flow, and variation in cerebral metabolic rate from normal to markedly reduced values. Cerebral arteriovenous O differences showed considerable variation, from greatly increased to reduced extraction of O. The results suggest that in some persons compensatory mechanisms may maintain the cerebral metabolism despite a reduction of arterial pressure and cerebral blood flow.

MARION HORN PESKIN (Chem. Abstr.)

Metabolism of Human Brain Cortex in vitro. Sutherland, V. C., et al. [*Am. J. Physiol.*, **180**, 195 (1955).]

The total O consumption during endogenous metabolism is greater than can be accounted for by the endogenous carbohydrate content determined as glucose and lactic acid. Endogenous lactic acid production and, to a limited extent, endogenous O consumption are suppressed by the addition of 0·01 M glucose. Experiments with 0·01 M radioactive glucose indicate that the glucose taken up is oxidized to some extent, converted to lactic acid, and assimilated or stored in the tissue. The amount of radioactive glucose oxidation accounted for only approximately 50 per cent. of the total O consumption in the presence of glucose. Lactic acid produced in the presence of 0·01 M extracellular glucose is derived exclusively from exogenous glucose. Aerobic lactic acid accumulation increases when glucose is present in combination with pyruvate or glutamate but not with alanine.

E. D. WALTER (Chem. Abstr.)

Regulation of Water Exchange by the Hypothalamus and Hypophysis. Pupilli, G. C. [*Terapia* (*Milan*), **34**, 129 (1949).]

Mainly neurological and physiological. In experimental operative diabetes insipidus, the secretion of antidiuretic hormone is deficient owing to interruption of the supraoptic-hypophyseal path.

W. C. TOBIE (Chem. Abstr.)

Effects of Acetylcholine on Phosphate Turnover in Phospholipides of Brain Cortex in vitro. Hokin, Lowell E., and Hokin, Mabel R. [*Biochim. et Biophys. Acta*, **16**, 229 (1955).]

The effects of acetylocholine (I) on the phospholipides of guinea-pig brain cortex slices were studied with P^{32} and glycerol-1-C^{14}. (I), with eserine, stimulated the incorporation of P^{32} in all the phospholipide fractions studies, but to unequal degrees. The stimulatory effect of (I), with eserine, increased with increasing (I) concentration; the minimum effective concentration was 10^{-6} to 10^{-5} M. The increased incorporation of P^{32} into the glycerophosphatides was due to an increased phosphate turnover in preformed lipides, rather than to increased synthesis of phospholipides de novo. (I) Failed to increase the incorporation of glycerol-1-C^{14} into brain cortex slices under conditions conducive to increased incorporation of P^{32}. (I) In a concentration of 10^{-2} M stimulated to about the same extent the incorporation of P^{32} into the glycerophosphatides of the various cell fractions, i.e. nuclei, mitochondria, microsomes, and supernatant fluid. Atropine at low concentrations (10^{-6} M) destroyed the stimulatory effect of (I), and decreased phosphate turnover to a level lower than that found in slices without (I) and eserine. At high concentrations (10^{-4} to 10^{-2} M) it stimulated incorporation of P^{32} into the phospholipides.

MORTON PADER (Chem. Abstr.)

Alteration of the Activity of Central Nervous System during Phosphorus Poisoning in Animals. Krasnov, S. K. [*Zhur. Vysshei Nervnoĭ Deyatel. im. I.P. Pavlova*, **4**, 558 (1954).]

Subcutaneous administration of P to white rats (10 mg./kg.) induces changes in the activity of the central nervous system, characterized by a complete or partial inhibition of previously established conditioned reflexes, natural reflexes to food, followed by lowering of unconditional reflexes. The symptoms of P poisoning develop considerably later than the observed inhibitions in the activity of the central nervous system.

J. A. STEKOL (Chem. Abstr.)

Effect of Hexamethonium Chloride on the Bioelectric Activity of the Dog Brain. Imbriano, Aldo E., et al. [*Semana méd.* (*Buenos Aires*), **1**, 274 (1955).]

Intraperitoneal injections of 15 mg./kg. change the α- and depress the β-waves. δ-waves of polymorphous character appear. The changes are attributed to a lack of O.

A. E. MEYER (Chem. Abstr.)

Metabolic Studies in Wilson's Disease using Copper-64. Bearn, A. G., and Kunkel, H. G. [*J. Lab. Clin. Med.*, **45**, 623 (1955).]

Cu^{64} was administered both orally and intravenously in doses of *f*0·1–1 mc. Following parenteral administration there was an extremely rapid fall in serum radioactivity in normal subjects which was subsequently followed by a large increase in serum radioactivity. This increase was due to the incorporation of the Cu^{64} into ceruloplasmin. In patients with Wilson's disease a slightly slower fall in the radioactivity and almost no incorporation into cerulo-

plasmin was observed. The Cu^{64} associated with serum albumin was increased and persisted longer in patients with Wilson's disease than in the controls. The persistence of excess Cu^{64} associated with albumin appears to be an important factor in the pathogenesis of the disease. The total urinary Cu^{64} excreted by Wilson's disease is greater than in normals. A delayed rise in urinary Cu^{64} was noted in normals. Patients with Wilson's disease showed a diminished fecal excretion of Cu^{64} following both routes of administration.

FRANK IBER (Chem. Abstr.)

Uric Acid Metabolism in Hepatolenticular Degeneration. Mahoney, J. P., et al. [*Proc. Soc. Exptl. Biol. Med.*, **88,** 427 (1955).]

In all of 16 patients with hepatolenticular degeneration (Wilson's disease) the serum uric acid level was below normal and the amount of uric acid excreted in the urine was increased. After intravenous injection of uric acid these patients excreted uric acid in the urine more rapidly than did normal subjects. No correlation was observed between the excretion of Cu and of uric acid. It is suggested that the alteration in uric acid metabolism is due to an inability of the renal tubules to reabsorb uric acid efficiently.

L. E. GILSON (Chem. Abstr.)

The Distribution of Phosphomonesterases and Pyrophosphatase in the Particulate Fractions of Dog Cerebrum. Waked, Nabil and Kerr, Stanley E. [*J. Histochem. Cytochem.*, **3,** 75 (1955).]

Dog cerebrum homogenized in 0·25 M sucrose can be fractionated by differential centrifugation into a nuclear sediment (I), 3 cytoplasmic fractions, and a final supernate (II). Although all fractions contain acid and alkaline (III) phosphatases, 5′-nucleotidase, and pyrophosphatase (IV), the activity of only (III) is marked in (I) while (II) is the principal source of (IV).

JOHN F. LHOTKA (Chem. Abstr.)

Relationship of Hallucinogens to Adrenergic Cerebral Neurohumors. Marrazzi, Amedeo S., and Hart, E. Ross. [*Science*, **121,** 365 (1955).]

Adrenaline, amphetamine, and mescaline have been shown to be cerebral synaptic transmission inhibitors. Because of the structural similarity of N,N-diethyllysergamide (LSD-25) and serotonin to adrenaline and its breakdown product, adrenochrome, they were tested as synaptic inhibitors. Serotonin is 6 to 8 times as potent as LSD-25 and 25 to 30 times as potent as adrenaline. The potency of serotonin is of the same level as acetylcholine suggesting a normal role as a neurohumoral inhibitor. Gamma doses do not affect blood pressure.

H.W.G. (Chem. Abstr.)

Blood-sugar Changes Induced by Electrical Stimulation of the Hypothalamus of the Cat. Anand, B. K., and Sua, S. [*Indian J. Med. Research*, **43,** 123 (1955).]

A rise in blood-sugar level resulted from stimulation of the posterior hypothalamic and mammillary regions as well as the lateral parts of the middle and anterior hypothalamic and supraoptic regions (sympathetico-adrenal effect). A fall in blood-sugar level (vago-insulin effect) resulted from stimulation of the medial parts of the supraoptic and anterior and middle hypothalamic regions.

C. J. CARR (Chem. Abstr.)

The Ventricular System in Hydrocephalic Rat Brains Produced by a Deficiency of Vitamin B_{12} or of Folic Acid in the Maternal Diet. Overholser, M. D., et al. [*Anat. Record*, **120,** 917 (1955).]

Congenital hydrocephalus in albino rats due to a deficiency of Vitamin B_{12} or of folic acid in the diet of the dam is caused by occlusion of the cerebral aqueduct in the embryo between the 16th and 18th day of gestation.

EDWARD J. VAN LOON (Chem. Abstr.)

Experimental Study of Oxygen Deficiency in the Brain and its Clinical Significance. Petrov, I. R. [*Fiziol. Zhur. S.S.S.R.*, **41,** 9 (1955).]

A review with many references. Experimental results in rats subjected to O deficiency are presented. A block of the activity of the central nervous system caused by narcotics or total body cooling raises the resistance of the brain to O deficiency to an extent that might be useful in clinical applications.

G. M. KOSOLAPOFF (Chem. Abstr.)

Effect of Diisopropyl Fluorophosphate on the Energy-rich Phosphates and Ribose of the Brain. Pscheidt, G. R., and Michaelis, M. [*Suomen Kemistilehti*, 28B, No. 1, 72 (1955).]

Diisopropyl fluorophosphate (DFP) poisoning in rabbits increased energy-rich phosphates and ribose in brain. Practically all the energy-rich phosphate except phosphocreatine is present as adenosinetriphosphate. The greatest increase in high-energy phosphate occurred 40 minutes after administration of the drug.

S. P. MARINO (Chem. Abstr.)

Enzymic Processes in Brain During Tuberculosis. Platonov, E. G. [*Trudy Akad. Med. Nauk S.S.S.R.*, **27**, No. 1, 10 (1953); *Referat. Zhur., Khim., No.* 29111 (1954).]

Tissue respiration, glycolysis, activities of phosphatase and cholinesterase, and the amount of acetylcholine were studied in brains of rabbits with tuberculosis. The animals were injected intravenously with 0·0001 mg. of bovine tubercle bacilli and brains were taken for analysis 2 and 24 hours, 3, 7, 14, and 28 days, and 3 and 5 months afterward. Shortly after injection a retardation of the oxidative processes was evident, especially in the cortex, with a simultaneous increase of glycolysis. The activity of phosphatase in the cortex and in the hypothalamic region was slightly higher in the first 7 days; in the cortex the activity increased further between the 14th and 21st day, and after 36 days the activity decreased rapidly to the normal level. In the hypothalamic region the activity of phosphatase after the 7th day remained slightly below normal. The activity of cholinesterase in the cortex decreased in the period between the 3rd and 21st day after injection; the reverse was true for the hypothalamic region. The amount of acetylcholine 3 days after injection was increased.

E. Wierbicki (Chem. Abstr.)

Electrolyte Disturbances in Cerebral Lesions. Anthonisen, Poul, et al. [*Acta Med. Scand.*, **150**, 355 (1955).]

Specific cerebral lesions involving the osmoregulatory center will primarily cause the organism to be dehydrated. Even a slight dehydration of this nature with diminution of the extracellular volume will secondarily stimulate the normal volume receptor and thus lead to salt retention.

Edward J. Van Loon (Chem. Abstr.)

The Relation Between Adrenal Cortical Activity and the Convulsive State. Glaser, Gilbert H. [*Epilepsia* (3), **2**, 7 (1953).]

A review. G. concludes that there is confusion about the adrenal cortical hormones and their activity as related to the convulsive state. There is some evidence that heightened susceptibility to seizures may be related to increased 11,17-oxycorticosteroid hormone activity, and that the reverse might be true with the deoxycorticosterone acetate group. The key may be correlated with the extra- and intra-cellular shifts of electrolytes, particularly Na and K. 80 references.

H.W.G. (Chem. Abstr.)

Biochemical Substrate of Nervous Trophism. Bykov, K. M., and Vasyutochkin, V. M. [*Fiziol. Zhur. S.S.S.R.*, **40**, 555 (1954).]

A review, in which it is pointed out that biochemical therapy which acts on the fundamental link of metabolism, cellular respiration, acts therefore on the substrate of nervous trophism. In so doing it normalizes the interoceptive and afferent reactions and thus facilitates the action of the central nervous system in normalizing metabolism of the organism as a whole. Examples of agents include the vitamin group (B_1, B_2, B_6, nicotinic acid, pantothenic acid, etc.).

G. M. Kosolapoff (Chem. Abstr.)

Effect of Stimulation of the Autonomic Nervous Center Upon the Thiamine Metabolism in Rabbit. Satoyoshi, Eijiro. [*Vitamins* (*Japan*), **8**, 68 (1955).].

When the autonomic nervous center in the hypothalamus was stimulated, changes in thiamine concentrations in the liver, kidney, heart, lung, spleen, and adrenal of rabbits were determined. Stimulation of the sympathetic center caused a considerable decrease of total thiamine content in the liver and kidney, a slight decrease in the lung, and little decrease in the heart, spleen, and adrenal. By stimulation of the parasympathetic center, no significant change was recognized in the nonesterified and esterified thiamine of the organs.

Hiroyasu Fukuba (Chem. Abstr.)

Formation of Acetylcholine from S-acetylthiamine. Ito, Shinji. [*Vitamins* (*Japan*), **8**, 31 (1955).]

The addition of O,S-diacetylthiamine (I) to the suspension in which pieces of excised small intestine of the albino rat were soaked, caused contraction of these pieces; this effect did not occur when the pieces were pre-treated with atropine. Contraction was stronger when choline (II) and (I) were simultaneously added to the suspension than when (I) alone was added. Neither glutathione nor cysteine was an activator, but they showed almost the same activating effect when added to the suspension containing (I) and (II). Thiamine had some suppressing effect on the contraction of intestinal loops with acetylcholine (III), but (I) and thiamine alkyl disulfide had no effect. Addition of O,S-dibenzoylthiamine to the suspension resulted in relaxation of the intestine and decrease of response to (III), histamine, or pituitrin.

Hiroyasu Fukuba (Chem. Abstr.)

Effect of High-intensity X-radiation on Velocity of Nerve Conduction. Gerstner, Herbert B., et al. [*Am. J. Physiol.*, **180**, 232 (1955).]

Sciatic nerves of bullfrogs and rabbits were isolated and stored at 24°. Conduction velocity was determined prior to and 1, 2, and 4 hours following exposure to various total doses at dose rates of approximately 9,000 r./minutes of X-radiation. In frog nerves, doses in

excess of 75 kr. caused a decrease in conduction velocity; doses above 300 kr. produced complete abolishment of conduction within 1 hour. Rabbit nerves were much more radiosensitive than frog nerves. Doses in excess of 45 kr. produced complete block within 1 hour following irradiation.

E. D. Walter (Chem. Abstr.)

The Quantitative Histochemistry of Brain. IV. Lactic, Malic, and Glutamic Dehydrogenases. Strominger, Jack L., and Lowry, Oliver H. [*J. Biol. Chem.*, **213**, 635 (1955).]

Micromethods were developed for lactic (LDH), malic (MDH), and glutamic dehydrogenases (GDH) in 3 γ or less of brain (dry weight). The assays are based on the measurement of diphospho pyridine nucleotide (DPN) reduction in the presence of appropriate substrate. Quantitative data were obtained for (LDH) and (MDH) in 6 layers of Ammon's horn, 4 layers of cerebellum, 4 layers of striate cortex, supraoptic nucleus, hypothalamus, optic nerve and tract, 4 layers of retina, 4 additional myelinated-fiber tracts, and dorsal-root ganglion cells. (GDH) was determined only in the layers of Ammon's horn. The distribution of (LDH) and (MDH) in Ammon's horn parallels the distribution of aldolase. The non-myelinated fiber and dendrite layers are particularly rich in (LDH) and (MDH); (GDH) occurs principally in the myelinated fibers and molecule layer of Ammon's horn. Three types of fiber tracts were distinguished on the basis of (LDH) and (MDH) activity. Retinal ganglion cells and their axons (optic nerve) are very rich in (LDH) and very poor in (MDH). Some structures deeper in the retina have a high (MDH) activity and a low (LDH) activity. The high glycolytic and respiratory rates in intact retina are, therefore, probably manifestations of different metabolic processes in different cells.

Felix Saunders (Chem. Abstr.)

Acetylcholine-like Action of Brain Extracts. Schumann, H. J. [*Naunyn-Schmiedebergs Arch. exptl. Pathol. Pharmakol.*, **225**, 110–11 (1955).]

Paper chromatography and evaluation of the frog rectus muscle and guinea-pig intestine tests proved that beef-brain extract contained acetylcholine, propionylcholine, and butyrylcholine.

A. E. Meyer (Chem. Abstr.)

The Metabolism of Normal Brain and Human Gliomas in Relation to cell Type and Density. Heller, Irving H., and Elliott, K. A. C. [*Can. J. Biochem. and Physiol.*, **33**, 395 (1955).]

Per unit weight, cerebral and cerebellar cortex respire much more actively than corpus callosum. The rate per cell nucleus is highest in cerebral cortex, lower in corpus callosum, and still lower in cerebellar cortex. The O-uptake rates of the brain tumors studied, with the exception of an oligodendroglioma, were about the same as that of white matter on the weight basis but lower than that of cerebral cortex or white matter on the cell basis. In agreement with previous work, an oligodendroglioma respired much more actively than the other tumors. The rates of glycolysis of the brain tumors per unit weight were low but, relative to their respiration rate, glycolysis was higher than in normal gray or white matter, Consideration of the figures obtained leads to the following tentative conclusions: Glial cells of corpus callosum respire more actively than the neurons of the cerebellar cortex. Neurons of the cerebral cortex respire on the average much more actively than neurons of the cerebellar cortex or glial cells. Considerably more than 70 per cent. of the O uptake by cerebral cortex is due to neurons.

The O-uptake rates of normal oligodendroglia and astrocytes are probably about the same as the rates found per nucleus in an oligodendroglioma and in astrocytomas; oligodendroglia respire much more actively than astrocytes.

A. E. Teeri (Chem. Abstr.)

Adrenaline Substance of the Brain and Suprarenals Under Increased Oxygen Pressure. Gershenovich, Z. S., et al. [*Ukrain. Biokhim. Zhur.*, **27**, 3 (1955).]

Rabbits 1·5–2·0 kg. were placed into compression chambers filled with pure O under 3·5 and 6 atm. pressure. The CO_2 resulting from respiration was absorbed by soda lime. Animals were observed through a window. The effects of O poisoning at 6 atm. show 3 distinct stages: I—The stimulation period during which the animal manifested restlessness accompanied by motor reactions and jerky motions of the head and appendages. This stage sets in 10–13 minutes after the O-pressure increase. II—The period of convulsions, which appear 20–25 minutes after the beginning of the experiment. III—The terminal period, the duration of which differs with each animal. It is characterized by a state of coma with the animal lying on its side, the respiration is profoundly disturbed, and death soon ensues preceded by specific terminal convulsions. Tests for adrenaline and its conversion products were made during each period. During (I) the adrenaline in the brain is lowered by 62 per cent., which is due to its breakdown, as can be inferred from the increase in the adrenochrome by 14·8 per cent. Dehydroadrenaline is reduced by 20 per cent. Adrenaline is also converted to substances other than adrenochrome, but their identity cannot be established for the lack of specific tests. During (II) adrenaline in the brain increases somewhat, while adrenochrome and dehydroadrenaline are decreased. The sum of the adreno substances is decreased by 40·6 per cent. During (III) adrenaline and dehydroadrenaline are increased only measurably, while adreno-

chrome is increased by 32·6 per cent. The total of adreno substances in the brain is increased by 14 per cent. as compared with the control and by 92·1 per cent. as compared with (II). In the suprarenals in (I) adrenaline is increased by 234 per cent., dehydroadrenaline by 33·8 per cent. and adrenochrome by 40 per cent. This points to an increased suprarenal functional activity under the influence of the high O pressure toxic condition of the central nervous system. In (II) the synthesizing function of the adrenals is considerably depressed. Adrenaline is reduced by 37·3 per cent as compared with (I) and by 41·7 per cent. as compared with the controls. Dehydroadrenaline and adrenochrome are decreased only slightly. During (III) the function of the suprarenals is completely distorted. No adrenaline can be detected, while dehydroadrenaline and adrenochrome increase. This may be due to the complete oxidation of the adrenaline or to the suprarenals synthesizing no adrenaline. Under pure O pressure of 3·5 atm. the same physiological reactions occur, but they are stretched out and delayed. The biochemical data vary in their percentage values, but the general character and trend of the results are the same.

B. S. Levine (Chem. Abstr.)

The Interrelation Between Functional State of Brain Cortex and Parathyroid Gland. Baranova, N. F. [*Problemy Endokrinol. i Gormonoterap.*, **1**, *No.* 2, 52 (1955).]

Extirpation of parathyroids in dogs lowered the blood Ca to 9–4·5 mg. per cent., and altered the responses of conditional reflexes to light and metronome beats of 120 strokes per minute. Raising the Ca concentration of blood by feeding the hypoparathyroid dogs $CaCO_3$ improved the physical state of the animals as well as the responses of the conditioned reflex. Parathyroid hormones affects the functional state of brain, cortex and the function of parathyroid gland is regulated by the brain cortex.

J. A. Stekol (Chem. Abstr.)

The Biochemical Constitution of Saliva in Unconditioned and Conditioned Reflex Responses. Skesterikova, T. P., and Sokolova, E. A. [*Ukrain. Biokhim. Zhur.*, **26**, 397 (1954).]

Two dogs were used. Saliva was obtained from the dissected and cannulated duct of the maxillary salivary gland following nutritional stimulation of dogs with conditioned and unconditioned salivary reflexes. Determinations were made of total N, dry residue, organic and inorganic constituents of Cl and of the n. The development of conditioned salivary reflexes is accompanied by an increase in the salivary exudate upon strong stimulation. In cases with a well established stereotype salivary reflex reaction the values of N, Cl and of the n are of a lesser magnitude in the saliva obtained from the conditioned than the unconditioned dog. Quantitative N and Cl studies indicate that the greater the impact of the conditioned stimulation the greater the percentage of solid substances in the secreted saliva.

B. S. Levine (Chem. Abstr.)

The Cerebrospinal Fluid of the Newborn. Woiski, J. R., et al. [*Arquiv. neuropsiquiat.*, **7**, 264 (1949).]

Physiol., biochem., and other data are given on 82 samples of cerebrospinal fluid from 52 newborn infants. It is generally xanthochromic in the first week of life, but becomes colorless after 20 days. A fibrin web is seen in some cases. The normal protein content on the first day is 0·25–1·58 g./l. After 3–4 weeks, the values approach those of the normal adult. The Cl level (as NaCl) is 7·03–7·49 g./l. The sugar content is 0·42–0·78 g./l. The lower values occur in the first few days.

W. C. Tobie (Chem. Abstr.)

Densities of Cerebrospinal Fluid of Human Beings. Davis, Harold and King, Wilbert. [*Anesthesiology*, **15**, 666 (1954).]

The densities of cerebrospinal fluid in 9 subjects was $1·0040 \pm 0·0004$ g./ml. at 25° and $1·0010 \pm 0·0003$ g./ml. at 37°; densities is most dependent on temperature and Na, Cl, and CO_2 concentrations and depends little on variations in protein concentrations.

Karl F. Urbach (Chem. Abstr.)

Electrophoresis of Proteins in the Cerebrospinal Fluid. Booij, J. [*Ned. Tijdschr. Geneesk.*, **1**, 64 (1950).]

The Tiselius method was modified and used for the small amounts of protein in the cerebrospinal fluid (I). Only albumins could be demonstrated in normal (I). If the total proteins were increased β- and γ-globulins were also demonstrable, α-globulin was not found in (I). Immunologically, an increase in γ-globulin in infectious diseases of the nervous system may be a favorable factor.

W. C. Tobie (Chem. Abstr.)

Concentration of Cerebrospinal Fluid for Preparation of Electropherograms. Pruckner, G., and Schwuttke, G. [*Arch. Psychait. Nervenkrankh.*, 193, 48 (1955).]

A concentration of 100-fold was obtained by pressure filtration through a protein-impervious filter.

Warren M. Sperry (Chem. Abstr.)

Influence of the Potassium Concentration of the Blood on the Potassium Level of the Cerebrospinal Fluid. Bekaert, J., and Demeester, G. [*Exptl. Med. Surg.*, **12,** 480 (1954).]

In experiments on dogs, the serum K concentration (I) was increased by traumatic shock, while the cerebrospinal fluid K concentration (II) was unchanged. Suboccipital injections of 1 ml. 1 per cent. KCl caused only a transient increase in blood pressure during shock. Intravenously injected insulin (III), with or without glucose (IV), lowered (I) and, to a lesser degree (II). Intraperitoneally injected 10 per cent. (IV) plus (III) lowered (I) without changing (II). Intramuscularly injected (III), did not change (I) or (II). In tuberculous meningitis, (I) lowering caused by intravenously injected (IV), was not accompanied by change in (II), nor was the (I) increase developing in adrenalectomized animals after withdrawal of therapy, the (I) decrease after injections of deoxycorticosterone, the (I) decrease after denervation of the carotid sinuses, and the (I) increase after intravenous infusion of isotonic KCl. Injection of histamine in beeswax-paraffin oil did not influence the K blood-cerebrospinal fluid barrier before and during KCl administration. After death in hyperkalemia, there was a rapid increase in (II). The marked (I) increase caused by injection of dinitro-l-naphthol was not accompanied by definite (II) increase as long as the temperature did not reach very high values. Hyperthermia produced by vaccine did not influence (I) or (II).

MARION HORN PESKIN (Chem. Abstr.)

The Plasmalogen Content of Cerebrospinal Fluid. Stammler, Albrecht. [*Arch. Psychiat. Nervenkrankh.*, **192,** 556 (1954).]

The dried residue from extraction of 2 ml. cerebrospinal fluid (CSF) with EtOH–Et_2O (2:1) was heated 5 minutes at 55° with 0·1 ml. AcOH and 0·1 ml. 2NHCl. After neutralization, color was developed by addition of 1 ml. fuchsin-H_2SO_3 solution, extracted after 15 minutes with amyl alcohol, with centrifuging, and read with Pulfrich filter 553. The average concentrations of plasmalogen (I) in (CSF) from 26 normal men and 26 normal women were 0·272 (0·075–0·475) and 0·342 (0·169–0·600) mg./100 ml. respectively. In 12 persons there was no correlation between blood serum and (CSF) (I) concentrations. The average concentration in serum was about 22 times that of (CSF). In most of 35 patients with organic diseases of the central nervous system and abnormalities in the (CSF) the (I) concentrations in (CSF) were normal.

WARREN M. SPERRY (Chem. Abstr.)

The Effect of Age on the Protein Concentration of Cerebrospinal Fluid of Normal Individuals and Patients with Poliomyelitis and Other Diseases. Muller, Otto, et al. [*Am. J. Med. Sci.*, **228,** 510 (1954).]

An increase in protein (I) concentration of the cerebrospinal fluid with age occurred to a slight extent in normal individuals, to a marked extent in patients with poliomyelitis. In normal persons, 40–45 mg. 1/100 cc. was generally found in adults up to age 60, somewhat lower values in infants and children, and up to 60 mg./100 cc. in adults above age 60.

MARION HORN PESKIN (Chem. Abstr.)

Mucoproteins in Normal and Pathological Cerebrospinal Fluid. Ferrante, Luigi and Cantarutti, Felice. [*Minerva pediat.*, **6,** 430 (1954).]

By the technique of Winzler applied to cerebrospinal fluid, mucoprotein values (in mg. tyrosine/100 cc.) were 0·4–0·5 in normal children, 0·8–0·9 in children with various diseases without meningeal irritation, and 2·0 in cases of acute meningitis. The ratio tyrosine/galactose-mannose in the cerebrospinal fluid was nearly the same as in blood mucoproteins.

C. SCANDURA (Chem. Abstr.)

2. Pharmacology and Treatment

The Effects of Xylocaine on the Central Nervous System with Special Reference to its Influence on Epileptic Phenomena. Berhard, C. G., and Bohm, E. [*Experientia*, **10,** 474 (1954).]

In cats intravenous injections of 2 mg./kg. body weight xylocaine were effective in abolition of epileptiform cortical after-discharges and ventral root outbursts after electrical stimulation of the cortex. The tonic asynchronous discharge in the radial nerve during cortical stimulation disappeared in treated animals.

D. S. FARNER (Chem. Abstr.)

Mysoline—a New Anticonvulsant. Lamobros, Vasilios S. [*Epilepsia* (3), **3,** 118 (1954).]

Mysoline (5-ethyldihydro-5-phenyl-4,6(1H,5H)-pyrimidinedione) was used in treatment of 494 new epileptic patients. The dosage started at 125 mg. daily and was increased until control was reached. Major convulsions, psychomotor seizures, myoclonic, traumatic, and minor seizures all responded in varying degrees to the drug. Mysoline was considered a satisfactory anticonvulsant, especially for major seizures, and produced only a minimum of toxic signs.

H. W. GILLEN (Chem. Abstr.)

The Intracellular Distribution of a Fluorescent Convulsant. Mayer, Steven E., and Bain, James A. [*Epilepsia* (3), **3**, 120 (1954).]

Fluorescence microscopy was used to determine the distribution of 10-(2-diethylaminoethyl)-9-acridone after a 12 mg./kg. dose in cats. Small tissue samples were fixed by freeze-drying and imbedded in paraffin. The convulsant was found to localize in the neuronal and glial nuclei. A characteristic blue fluorescence was predominantly in the nucleolus and along the surface of the nucleus. The staining seemed to be specific for the cells of the nervous system.

H. W. GILLEN (Chem Abstr.)

Hydrazides as Metabolic Convulsants. Pfeiffer, C. C., et al. [*Epilepsia* (3), **3**, 121 (1954).]

Unsubstituted hydrazides (thiosemicarbazide, carbohydrazide, thiocarbohydrazide, semicarbazide, isonicotinoyl hydrazide) are all carbonyl trapping agents, diamine oxidase inhibitors, inhibitors of enzyme systems catalyzed by pyridoxal phosphate, and all produce convulsions after a latent period of 1 hour. Repeated maximal seizures occur for 4 to 5 hours. When topically applied to the cerebral cortex, the hydrazides produce fast, high-voltage spiking activity, recorded on the electroencephalogram. The hydrazides lower the threshold to photic stimulation-induced seizures in most species. Semicarbazide increases sensitivity to metrazole, but not to strychnine, electroshock or NH_4^+. Acetone, phenurone, trimethadione, phenobarbital, α-ketoglutarate, pyruvate, and glucose are effective antidotes. The B_6 group of vitamins are also antidotal to hydrazide convulsions.

H. W. GILLEN (Chem. Abstr.)

A Study of the Anticonvulsant Properties of Phenobarbital and Dilantin. Chen, Graham and Ensor, Charles R. [*Arch. intern. pharmacodynamic*, **100**, 234 (1954).]

In mice, the antielectric shock effect of pentobarbital and barbital is an abrupt increase of the threshold, probably caused by paralysis of the spinal cord, while the effect of phenobarbital and dilantin is slow to reach a maximum, and is shown in nonhypnotic doses. The difference in action is seen when these drugs are given in combination, and the last 2 drugs given together show a potentiation of antielectric shock effect, but no increase in toxicity. This is a possible mechanism for their therapeutic efficiency in epilepsy.

M. L. C. BERNHEIM (Chem. Abstr.)

Effect of Metrazol and Nembutal on Motor Activity in the Spinal Cat. Jones, David P., and Lombroso, Cesare T. [*Am. J. Physiol.*, **180**, 209–14 (1955).]

The effect of metrazole and nembutal upon spontaneous and evoked motor activity was studied in 12 cats after high spinal section. After injection of metrazol, 11 cats had spontaneous seizure discharges and 8 had bilateral muscular responses to electric stimulation of a cutaneous nerve. Nembutal, even in very small doses, exerted a markedly depressant action in the spinal animals.

E. D. WALTER (Chem. Abstr.)

Mutual Action of Carbon Dioxide and Convulsants. Langnickel, D., et al. [*Naunyn-Schmiedebergs Arch. exptl. Pathol. Pharmakol.*, **224**, 434 (1955).]

Carbon dioxide causes a reduction of the convulsive action of metrazole, Azoman, picrotoxin, and coramine, but augments the convulsions produced by strychnine, brucine, and nicotine. This enhancing effect is localized, in the case of strychnine, in the spinal cord. The experiments were performed on cats.

A. E. MEYER (Chem. Abstr.)

Reserpine Effects in Epileptic Monkeys. Chusid, Joseph G., et al. [*Proc. Soc. Exptl. Biol. Med.*, **88**, 276 (1955).]

Intravenous reserpine treatment produced behavioral changes in epileptic monkeys resembling those described for similarly treated normals. Electroencephalograms are shown and discussed.

L. E. GILSON (Chem. Abstr.)

Cortical (Brain) Bioelectric Changes in Human Beings Produced by Hexamethonium Chloride. Imbriano, Aldo E., et al. [*Semana méd. (Buenos Aires)*, **1**, 325 (1955).]

The modifications observed with increasing dose given intravenously were: Increase and well synchronized α-rhythm; bursts of irregular slow rhythms with tendency to become generalized; bursts of rapid spikes.

A. E. MEYER (Chem. Abstr.)

Drug Therapy of Parkinson's Syndrome: a Review. Drake, Frank R. [*Am. J. Med. Sci.*, **228**, 97 (1954).]

79 references.

MARION HORN PESKIN (Chem. Abstr.)

Experimental Study on the Physiological Distribution and Metabolism of Phenacemide (Phenurone). Richards, R. K., et al. [*Epilepsia* (3), **3**, 120 (1954).]

Carbon-14-labelled Phenurone was used and recovered from the intestinal tract and the

brain. Only small amounts (no figures) were found in the brain. The anticonvulsant protection of phenacemide seemed to correlate with the quantity in the brain.

H. W. GILLEN (Chem. Abstr.)

Pharmacological Studies on the Phosphorus Metabolism of the Brain with Radioactive Phosphorus-32. Takenaka, Fumio, et al. [*Folia Pharmacol. Japan*, **50,** *No.* 2, 161 (1954).]

The content of P in the blood plasma of rat 3, 5, and 24 hours after intra-abdominal injection of inorganic P after fasting was 8·26, 8·36, and 7·84 mg. per cent. respectively; anesthetizing with urethan decreased the contents to 5·54, 5·03, and 5·21 mg. per cent. respectively. After administration of P^{32}, no difference was observed in the content in plasma at varied intervals. The specific activity of P^{32} (P^{32} c.p.m./mg. P^{31}) in brain tissues was 1 per cent. of the content in blood plasma 3 hours after intra-abdominal injection and 5 per cent. after 24 hours. The P was mainly obtained in an acid-solution fraction of brain tissues. The pathway of the P administered to brain tissues was discussed. The ratio of organic P^{32} to inorganic P^{32} in the acid-solution fraction from brain tissues was 0·28 at 5 hours and 0·37 at 24 hours after administration of P^{32}; this small difference may indicate that synthesis of organic P from inorganic P compounds is rapid before 5 hours after administration and slow later. The P^{32} content in other fractions was 12 and 24 per cent. of the content in the acid-solution fraction 5 and 24 hours after administration, respectively. Anesthetizing with urethan did not change the amount of P^{32} moved to brain after intra-abdominal injection. Administration of urethan increased the acid-solution P fraction in the brain. Urethan decreased the P^{32} content in other fractions, particularly at 5 hours after the administration of P^{32}. The ratio of inorganic to organic P^{32} in the acid-solution fraction was not affected by urethan.

SCHOZABURO KITAOKA (Chem. Abstr.)

The Use of a New Preparation for Cure of Insomnia. Gibellini, Fausto. [*Policlinico* (*Rome*), *Sez. prat.*, **62,** 350 (1955).]

The carbamate of phenylethynylcarbinolat 0·15–0·30 g. produced sleep for 5–8 hours in psychoneurotic patients. The incubation period was 0·5–1 hour. The drug was not habit-forming and was well tolerated, and no alteration of normal function of liver and kidney was noted after administration. LD_{50} in white mice was 275 mg./kg., and hypnosis for 1 hour was obtained with 150 mg./kg. The point of attack seems to be on the cortical and subcortical centers.

M. ELLIOTT (Chem. Abstr.)

Influence of Small Doses of Thyroidin on the Higher Nervous System Activity in Dogs. Baranov, V. G., et al. [*Problemy Endokrinol. i Gormonoterap.*, **1,** *No.* 1, 28 (1955).]

An alteration in the conditioned reflex activity of dogs was obtained by the administration of small doses of thyroidin which did not affect the O consumption, indicating the influence of small doses of thyroidin on the nerve cells. Oxygen-consumption measurements are not always reliable criteria of excess of thyroxine in the organism, as they do not detect the early effects of thyroxine on the nerve cells. This may have a bearing on various diseases, such as neurosis, in which no visible or measurable changes in the thyroid gland or its activity can be detected.

J. A. STEKOL (Chem. Abstr.)

Pharmacological Studies on the Function of the Extra-pyramidal System. I. Significance of Corpus Striatum in the Presence of Extrapyramidal Poisons. Kawamori, Kazuhiko. [*Folia Pharmacol., Japan*, **50,** 17 (1954).]

The corpus striatum of mouse was submitted to high frequency electrocautery and the significance of the striatum for the development of action of extrapyramidal poisons was examined. The action of harmine was decreased when the anterior portion of the striatum was injured, while the injury of the posterior portion exerted a reduction of action of bulbocapnine.

Pharmacological Studies on the Function of the Extra-pyramidal System. II. Significance of Hypothalamus, Mid-brain, and Cerebellum in the Presence of Extrapyramidal Poisons. [*Ibid.*, **50,** 27 (1954).]

Hypothalamus, mid-brain, and vermis of the cerebellum were treated by high frequency electrocautery. Injury in hypothalamus and mid-brain, particularly in the ventral portion of both sides of each, inhibited the action of extrapyramidal poisons, whereas partial injury in mid-brain and cerebellum appeared to have no direct effect on either harmine or bulbocapnine.

SHOZABURO KITAOKA (Chem. Abstr.)

Drug-produced Experimental Psychoses. Fischer, Roland and Agnew, Neil. [*Naturwissenschaften*, **41,** 431 (1954).]

Wool protein was used as model surface simulating the neuroreceptors involved in drug-induced psychoses. The millimoles $\times 10^{-2}$ of such drugs adsorbed by 1 g. wool was for mescaline 0, methedrine 0·6, lysergic acid monoethylamide 1·1, lysergic acid diethylamide 2·6; the corresponding doses required by humans are 0·5, 0·1, 0·001, and 0·0001 g. The

adsorption of a number of phenothiazines on wool was estimated to determine the possible inhibitory effects relative to the psychotic effect. Methylene blue, parsitan, largactil, and diparcol have increasing affinity to wool: 3·3, 4·8, 5·3, and 5·5 millimoles $\times 10^{-2}$ per g. wool. Affinity for wool of the 7 compounds tested and relative toxicity on tadpoles are in the same order. Preliminary experiments show that higher affinity for wool may be associated with more complete inhibition of experimental psychosis.

B. J. C. VAN DER HOEVEN (Chem. Abstr.)

Effect of Chlorpromazine on Phosphorylation of Brain Mitochondria. Abood, L. G. [*Proc. Soc. Exptl. Biol. Med.*, **88**, 688 (1955).]

Chlorpromazine uncoupled the oxidative phosphorylation of rat brain mitochondria and inhibited cytochrome oxidase in concentrations not affecting over-all oxidation. Since the drug inhibits the adenosinetriphosphatase activity of mitochondria, it presumably does not uncouple by accelerating high-energy phosphate breakdown. It is suggested that it acts by reversibly altering intramitochondrial relations.

L. E. GILSON (Chem. Abstr.)

2-Amino-5-chlorobenzoxazole (McN-485, Flexin), a longacting Spinal Cord Depressant. Kamino, Kazuya and Koell, George B. [*Proc. Soc. Exptl. Biol. Med.*, **88**, 565 (1955).]

The drug produces selective depression of polysynaptic spinal reflexes in cats at lower doses than those required to block monosynaptic reflexes. In much higher doses it inhibits the response of indirectly stimulated skeletal muscle. Its duration of action is extremely long and its toxicity is low.

L. E. GILSON (Chem. Abstr.)

Acute and Chronic Barbiturate Poisoning. Malmros, H., et al. [*Nord. Med.*, **41**, 305 (1949) (in Swedish); *Excerpta Med., Sect. VIII*, **3**, 395).]

Chemical antidotes and physical countermeasures are considered.

W. C. TOBIE (Chem. Abstr.)

The Value of Barbiturate Estimation in the Diagnosis and Treatment of Barbiturate Intoxication. Wright, J. T. (London Hosp.). [*Quart. J. Med.*, **24**, 95 (1955).]

There is a quantitative relationship between the blood concentration of barbiturate derivatives and the degree of depression of the nervous system. Comparatively low levels may be associated with profound depression when the picture is complicated by shock, anoxia, the addition of other poisons, senility, and possibly parkinsonism. Relatively high values may be tolerated after continued usage of barbiturates. Barbiturates are more or less uniformly distributed throughout the body water; hence it is possible to calculate the approximate dose ingested from the patient's weight and the maximum concentration of barbiturate in the blood. Soon after ingestion of barbiturates, large concentrations appear in the liver, but subsequently diminish to the same order as in the blood; hence in fatal cases some estimate can be made of the time between ingestion and death. Barbiturates always remain low in the spinal fluid. Renal clearance of barbital is greater than that of phenobarbital, and the clearance in both cases is slightly increased at higher rates of urine flow, but is not significantly influenced by agents designed to alter the pH of the urine. The practice of forced diuresis is not justified. Gastric lavage is of little value 4 hours after ingestion.

JOHN T. MYERS (Chem. Abstr.)

Sodium Succinate in Pentobarbital Depression of the Cerebral Cortex and Medulla Oblongata. Larson, Edward, et al. [*Anesthesiology*, **16**, 239 (1955).]

In vitro, slices of rat cortex and medulla oblongata show decreased O consumption after addition of pentobarbital. Na succinate prevented or overcame this decreased O consumption.

KARL F. URBACH (Chem. Abstr.)

Bromide Intoxication. Campbell, J. D. [*Southern Med. J.*, **42**, 967 (1949); *Excerpta Med., Sect. VIII*, **3**, 394 (1950).]

Bromide intoxication (I) is almost always associated with a more serious mental disorder. In normal individuals, a level of 150 mg. per cent. blood bromide may be necessary to produce (I), but in chronic alcoholics or persons on a salt-free diet much lower levels will produce (I). NaCl is a specific antidote, but must not be given in excessive amounts.

W. C. TOBIE (Chem. Abstr.)